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THESIS

**DETECTING WAR OR COURTING DISASTER:
AN ANALYSIS OF NUCLEAR WEAPONS
IN THE INDIAN OCEAN**

by

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March 2015

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AN ANALYSIS OF NUCLEAR WEAPONS IN THE INDIAN OCEAN**

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ABSTRACT

One of the core assumptions of nuclear strategy is that submarine-based deterrent assets stabilize deterrent relationships by providing an assured second-strike capability. As India progresses toward an operational sea-based deterrent, this thesis seeks to qualify this foundational assumption by exploring the empirical conditions under which this principle operated during the Cold War. It then examines whether these conditions—and by extension the standard logic regarding sea-based deterrence—apply in South Asia. Using the India-China and India-Pakistan dyads as discrete cases, this thesis analyzes the potential effects of India's introduction of a ballistic missile submarine (SSBN) on each dyad. While an operational sea-based deterrent should hypothetically provide India with a greater sense of existential security vis-à-vis China, there is little evidence to suggest that India will cease to pursue additional nuclear or conventional capabilities. India's SSBN thus fails to resolve perceived security threats from China, even as it exacerbates arms racing tendencies in Pakistan. Furthermore, it is likely to generate conventional maritime arms races in both dyads that could prove destabilizing in a crisis. This thesis finds that assumptions based on Cold War-era analyses do not accommodate the geographic, bureaucratic, operational, or strategic realities of South Asia. Thus, this thesis concludes that traditional assumptions about SSBNs fail to acknowledge the conditionality of their strategic value while overlooking the potential dangers posed by the introduction of these systems.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIP	Air-independent propulsion
ASW	Antisubmarine warfare
C2	Command and control
CNO	Chief of Naval Operations
DRDO	Defence Research and Development Organisation
GIUK	Greenland-Iceland-United Kingdom
HADR	Humanitarian assistance and disaster relief
HDW	Howaldtswerke-Deutsche Werft
HEN	Hotel, Echo, November (the first classes of Soviet nuclear submarines)
ICBM	Intercontinental ballistic missile
IOR	Indian Ocean Region
IRBM	Intermediate-range ballistic missile
ISR	Intelligence, surveillance, and reconnaissance
NATO	North Atlantic Treaty Organization
PAL	Permissive action link
SLBM	Submarine-launched ballistic missile
SLOC	Sea line of communication
SSBN	Ballistic missile submarine, nuclear powered
SSGN	Guided missile submarine, nuclear powered
SSK	Diesel-powered submarine
SSN	Attack submarine, nuclear powered
SSP	Attack submarine, diesel powered equipped with AIP
SUBSAFE	Submarine Safety Program

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

Within the next decade, both India and Pakistan are likely to have deployed nuclear weapons on submarines. China has already achieved this milestone and may eventually extend deterrence patrols into the Indian Ocean Region (IOR). By the end of the Cold War, the value of the sea-based leg of the nuclear triad was unquestioned; ballistic missile submarines (SSBNs) offered the secure second-strike capability that cemented mutually assured destruction, and thus, created strategic stability between the two superpowers. Given the complex security dynamics between India, Pakistan, and China, it is hardly surprising that all three countries are pursuing a nuclear triad.

As medium nuclear powers move toward triads, however, it is worth examining whether sea-based nuclear weapons are indeed as stabilizing to adversarial dyads as is traditionally held. Cold War analyses of ballistic missile submarine dynamics addressed two large submarine forces, operating in maritime and geostrategic environments that differ radically from that of South Asia. For the United States, questions of bureaucratic and organizational change, the sustainability of acquisitions, and the advances in anti-submarine warfare capabilities also loomed large in its efforts to establish and maintain a credible assured second-strike delivery system. As this thesis will show, the literature and theory developed around the Cold War does not accommodate the relatively small size and relative inexperience of the South Asian submarine services, the asymmetry between India and China's fleets, and the vagaries of India's naval acquisition and development programs. Furthermore, the Indian Ocean presents a different geostrategic picture than the Barents Sea or Kamchatka Peninsula did during the Cold War, and therefore presents different operational and tactical problems for these navies and policymakers—with distinct strategic implications.

By studying the conditions under which sea-based deterrents benefit stability, we can gain some insight into the impact sea-based nuclear weapons could have on security dynamics in South Asia. Given the dissimilarities between the Cold War and the South

Asian cases, this thesis will evaluate how applicable the traditional model is to South Asia. In Section 1.C, Problems and Hypotheses, I identify four main problems or challenges associated with the acquisition and induction of SSBNs and the impact these challenges could have on arms race stability and crisis stability. I then examine the empirical evidence to determine how the United States succeeded or failed to address these challenges and, by extension, the internal and external conditions under which sea-based deterrence operated during the Cold War. These challenges and conditions are then applied to the South Asian dyads to determine the potential regional impacts of an Indian triad. I conclude that while an operational sea-based deterrent should hypothetically provide India with a greater sense of existential security vis-à-vis China, it is unlikely to cause India to abandon its pursuit of additional nuclear capabilities, suggesting that the introduction of an Indian SSBN does not offer the solution to India's perceived security threats from China. An Indian sea-based deterrent does, however, exacerbate arms racing tendencies in Pakistan, even as its induction poses substantial challenges for the Indian political and naval establishments. Furthermore, while an Indian SSBN fleet could provide stability at the strategic or nuclear level under certain conditions, it is also likely to generate conventional maritime arms races in both dyads. The growth of conventional naval arsenals could have potentially deleterious effects on crisis stability, particularly if they come into contact with strategic systems.

B. SIGNIFICANCE

In August 2013, the reactor for INS *Arihant*, India's first indigenously built SSBN, went critical, marking a milestone in India's development of advanced undersea capabilities. First launched in 2009 for several years of trials, *Arihant* is powered by an 83-megawatt nuclear reactor and is expected to carry 12 submarine-launched ballistic missiles (SLBMs), referred to as K-15 or *Sagarika*.¹ India has indicated that it intends to build a five- or six-ship *Arihant*-class fleet that would provide a secure and assured

¹ "PM launches INS Arihant in Visakhapatnam," *The Times of India*, July 26, 2009.
<http://timesofindia.indiatimes.com/city/hyderabad/PM-launches-INS-Arihant-in-Visakhapatnam/articleshow/4820660.cms>.

second-strike capability.² Pakistan has also been pursuing the nuclear weaponization of its submarine force, even as it has been in discussions to acquire new air-independent propulsion (AIP) diesel submarines (SSPs) that represent a substantial improvement over its current fleet. Chinese attack submarines have been seen patrolling in the Indian Ocean, which India has taken as an effort to “[undermine] the Indian Navy’s [ability] ‘to control highly-sensitive sea lines of communication.’”³ The recent announcement that Pakistan is moving to finalize a contract for Chinese submarines, along with China’s continued development of the port at Gwadar, suggests the China-Pakistan maritime relationship is deepening, potentially to India’s detriment.⁴

These developments have serious implications for regional stability. After a series of wars and countless border skirmishes over the last 60 years, the India-Pakistan conflict remains unresolved. Pakistan’s disadvantage against India in its conventional military capabilities has endured, and the conventional gap between the rivals will only grow as India invests heavily in new, more advanced weapons systems. India has also developed what is colloquially known as the Cold Start doctrine, which calls for a rapid but shallow incursion into Pakistan.⁵ Cold Start is seen in India as a doctrine for limited war, rather than a total war that would certainly invite nuclear retaliation by Pakistan. As Pakistan’s ability to deter India conventionally has withered, it has developed short-range, low-yield

2 Praveen Swami, “Arihant Propels India to Elite Club, but with a Headache,” *The Hindu*, June 4, 2014, <http://www.thehindu.com/news/national/arihant-propels-india-to-elite-club-but-with-a-headache/article6079477.ece>; Rahul Bedi, “Indian Navy Plans New Carrier, SSBN Base in Bay of Bengal,” *IHS Jane’s Defence Weekly*, August 31, 2014, <http://www.janes.com/article/42605/indian-navy-plans-new-carrier-ssbn-base-in-bay-of-bengal>. The *Arihant*-class fleet size has been variously reported as low as two and as high as five. Three SSBNs is the bare minimum necessary for continuous deterrent patrols, which would be the most reasonable force posture for India’s ballistic missile fleet, as India does not have a natural bastion area in which to station its boats.

3 Rahul Singh, “China’s Submarines in Indian Ocean Worry Indian Navy,” *Hindustan Times*, April 7, 2013, <http://www.hindustantimes.com/India-news/NewDelhi/China-s-submarines-in-Indian-Ocean-worry-Indian-Navy/Article1-1038689.aspx>.

4 Saibal Dasgupta, “Pak Set to Get Chinese Submarines amid Sub Crisis in India,” *The Times of India*, March 1, 2014, <http://timesofindia.indiatimes.com/world/china/Pak-set-to-get-Chinese-submarines-amid-sub-crisis-in-India/articleshow/31191301.cms>; Vijay Sakhuja, *Asian Maritime Power in the 21st Century: Strategic Transactions: China, India, and Southeast Asia* (Singapore: Institute of Southeast Asian Studies, 2011), 277, 280.

5 Gurmeet Kanwal, “India’s Cold Start Doctrine and Strategic Stability,” *IDS Comment*, June 1, 2010, http://www.idsa.in/idsacomment/IndiasColdStartDoctrineandStrategicStability_gkanwal_010610.html.

nuclear weapons that could be used against an Indian offensive column that crossed the international border in a Cold Start-style attack.⁶ Pakistani interlocutors have suggested that Pakistan might be willing to use these low-yield nuclear weapons on its own territory to halt an Indian advance. While not entirely credible, India has suggested it would massively retaliate against any nuclear use against Indian troops, even if those troops were on Pakistani soil at the time. The rivals may be in a temporary checkmate situation, but nonstate actors sponsored by Pakistan remain a wild card; another Mumbai-style attack could spark a shooting war that carries the possibility of a nuclear exchange.

The India-China relationship is less volatile but also troubled; while there is less concern about a surprise trigger event, there remain outstanding territorial disputes, with occasional flare-ups of tensions such as the September 2014 standoff in Ladakh.⁷ Looking ahead, both states are actively pursuing great power status through economic and military development and modernization. In order to continue their rapid growth, India and China require secure access to oil. The volume of trade that passes through the Indian Ocean is staggering; roughly two-thirds of the world's petroleum products transit this space, along with 50% of the world's container traffic.⁸ The need to protect and control this trade is a critical driver of naval expansion and modernization among regional actors. The combination of economic incentives, pervasive mistrust, and unresolved historical conflicts has generated a conventional and nuclear arms race, in which the introduction of sea-based nuclear weapons is a significant development.

6 See *inter alia* Shashank Joshi, "Pakistan's Tactical Nuclear Nightmare: Déjà Vu?," *The Washington Quarterly* 36, no. 3 (2013): 159–72; David Smith, "The U.S. Experience with Tactical Nuclear Weapons: Lessons for South Asia," Washington, DC: Stimson Center, March 3, 2013; Jeffrey McCausland, "Pakistan's Tactical Nuclear Weapons: Operational Myths and Realities," Washington, DC: Stimson Center, March 10, 2015.

7 Shannon Tiezzi, "China, India End Military Stand-Off Along Disputed Border," *The Diplomat*, October 1, 2014, <http://thediplomat.com/2014/10/china-india-end-military-stand-off-along-disputed-border/>.

8 Salman Khurshid, Julie Bishop, and Marty Natalegawa, "Putting out to Sea a New Vision," *The Hindu*, November 2, 2013, <http://www.thehindu.com/opinion/op-ed/putting-out-to-sea-a-new-vision/article5305845.ece>.

C. PROBLEMS AND HYPOTHESES

The central question this thesis will address is under what conditions SSBNs can be said to contribute to stability. While the Cold War adversaries achieved strategic stability, the conditions under which they operated their ballistic missile submarines fleets are not the same conditions as exist in South Asia today. This thesis seeks to argue that the introduction of SSBNs in the IOR will be problematic for four main reasons:

1. *Bureaucratic and Organizational Change*: The induction of nuclear-powered submarines requires significant bureaucratic and organizational change in order to make the delivery systems safe and assured; absent these changes, an adversary may convince itself that the putative second-strike capability is not credible or could be attrited. A more credible and assured second strike can dampen strategic arms race incentives through mutual vulnerability, particularly when the missile ranges are long and the missiles reliable. It also stabilizes crises by mitigating first mover advantages and reducing use-or-lose pressures.
2. *Advancements in Anti-Submarine Warfare (ASW)*: SSBNs generate a concurrent demand for the ability to monitor and potentially defeat an adversary's antisubmarine warfare (ASW) capabilities—particularly a demand for quiet, nuclear-powered fast attack submarines (SSNs). As ASW capabilities grow qualitatively and quantitatively, the perceived need for additional strategic assets may also increase. During crises, an adversary's ASW assets may generate use-or-lose pressures on strategic systems. SSNs could also cause crises to break out as the result of accidents or incidents at sea.
3. *Operational Areas and Geostrategic Realities*: The characteristics of operational areas matter, especially when missile ranges are limited. In South Asia, geostrategic realities make India's SSBNs more threatening to Pakistan than to China simply because of the distances involved. The arms race implications for the India-Pakistan dyad are clear: Pakistan's vulnerability has already generated demand for increased ASW capabilities as well as its own nuclear triad. China is less likely to change its nuclear force structure in response to Indian advances, but may opt to deploy more passive and active ASW assets near chokepoints. Operational realities also affect crisis stability. By virtue of their constant mobility, SSBNs carry an unavoidable risk of accidental contact with an adversary

during peacetime.⁹ The South Asia navies operate in much more congested waters than the Cold War navies did, with an attendant higher risk of accidents or incidents at sea. Congestion also makes ASW more difficult, and Pakistan in particular may fear a surprise attack from an Indian SSBN.

4. *Naval and Nuclear Doctrine and Strategy*: Greater clarity about command and control and plans for civilian oversight would be stabilizing factors. Naval doctrine and strategy is also important; naval strategies that envision the early, preemptive use of ASW against strategic assets in a crisis are inherently threatening. The growth of India's SSBN fleet beyond a scant handful of boats could be read as a signal that India's commitment to No First Use is weakening, generating upward pressure on strategic arsenals. Beyond the impact of aggressive naval strategy, crisis stability could also be threatened if Indian C2 fails.

Using these four categories of challenges, I will explore what conditions had to be met in the Cold War to generate strategic stability, then turn to the Indian dyads to determine which of these conditions may or may not hold and thus whether India's SSBN will offer the stability and security that India seeks. It is this thesis's contention that India will be incurring significant costs and risks without resolving its primary security concerns with either China or Pakistan.

The literature on deterrence generally holds that SSBNs stabilize deterrent relationships by providing an assured second-strike capability that dampens arms racing behavior and reduces first-use incentives. By making nuclear assets harder to find, SSBNs ensure that even if an incoming counterforce first strike destroyed the land-based weapons, the sea-based arsenal would remain available for countervalue retaliation.¹⁰ Once this assured second-strike capability is reached, there should be less incentive to

⁹ This risk is aggravated by the need for stealth on the part of SSBNs. While nuclear-armed aircraft and surface ships could come into accidental contact, there is a greater chance of early detection and greater situational awareness with these types of systems. Submarines, on the other hand, must remain undetected to remain safe. This has even led to collisions between allies, who ostensibly have little reason to keep the other in the dark about operational areas and plans. The 2009 collision between the British SSBN HMS *Vanguard* and the French SSBN FNS *Le Triomphant* stands as one such example. See Rachel Williams and Richard Norton-Taylor, "Nuclear Submarines Collide in Atlantic," *The Guardian*, February 16, 2009, <http://www.theguardian.com/uk/2009/feb/16/nuclear-submarines-collide>.

¹⁰ A counterforce strike targets an adversary's nuclear weapons, including related command and control infrastructure. A countervalue strike is a nuclear strike against a civilian target, such as a major population center. A countervalue strategy was expected to hold cities hostage by threatening to inflict unacceptable damage, thus engendering deterrence by threat of unacceptable punishment.

arms race, as there is theoretically no military utility gained in the introduction of additional weapons, especially for states with a No First Use (NFU) policy. With this in mind, the introduction of nuclear weapons at sea could be read as a positive development, particularly between India and China. China has achieved an operational sea-based second-strike capability vis-à-vis India; if India can achieve mutual vulnerability with China via an SSBN fleet, it could be less inclined to pursue a larger land-based nuclear arsenal.¹¹

An assured second strike will not stabilize the India-Pakistan dyad, however. The main threat India faces from Pakistan is violent non-state actors, while Pakistan's overriding fear is a conventional conflict that threatens Pakistan's survival. Neither of these concerns is necessarily obviated by India's possession of SLBMs. Should Pakistan acquire a triad in pursuit of parity with India, it is possible Pakistan could feel more secure about the survivability of its deterrent, and thus less likely to engage in arms racing behavior. It is more likely, however, that Pakistan would simply add sea-based weapons to its arsenal while continuing its pursuit of tactical nuclear weapons in hopes of deterring a Cold Start-style attack. Sea-based nuclear weapons dampen first-strike incentives and could thus promote crisis stability, but even today, with several dozen land-based nuclear weapons each, both India and Pakistan would be hard-pressed to eliminate their opponent's entire arsenal in a first strike; their ISR and targeting capabilities are simply not up to the task of finding and destroying approximately 90 warheads in one blow. Thus, they already face the possibility of a countervalue second strike. Basing nuclear weapons at sea would contribute only marginally to the goal of arsenal survivability, especially if the subs carrying them are noisy and easily found.

The historical record of nuclear weapons at sea and their impact on crisis stability is murky at best, and it is here that the dangers of India's pursuit of a sea-based deterrent are most pronounced. There are numerous risks inherent in sea-based nuclear arms, ranging from command and control failures to nuclear accidents to theft of fissile materials to crises that escalate to war. Schelling's point regarding the possibility of a

¹¹ Hans M. Kristensen and Robert S. Norris, "Chinese Nuclear Forces, 2013," *Bulletin of the Atomic Scientists* 69, no. 6 (2013): 79–85.

submarine-launched first strike should not be overlooked, particularly as it pertains to crisis stability. In the event of a crisis, fear of a bolt-from-the-blue countervalue first strike could incentivize India's adversaries to target the Indian SSBN. This could create "use it or lose it" pressures for India: either India uses the warheads aboard the SSBN or it risks losing them to enemy ASW.

Indeed, if states are unwilling to accept a position of mutual vulnerability, the introduction of an SSBN capability will generate demand for improved attack submarine fleets, either to protect the SSBNs or for ASW. There are numerous pathways by which submarines could be used provocatively without necessarily triggering an open conflict. Currently, there is little dialogue between India and Pakistan or China about how each side perceives naval, particularly subsurface, actions and how these states might mitigate worst-case thinking that could cause crises at sea to spiral. All three states are either actively building or acquiring additional SSNs and/or SSKs with AIP. Attack submarines provide the best ASW capability available, and are thus particularly worrisome from a crisis management perspective. As the quantity and quality of submarines in the IOR—particularly those capable of carrying nuclear weapons or of tracking and killing other submarines—increases, there is a slim but growing danger of accidental or inadvertent escalation in both dyads.¹²

Thus, while SSBNs may offer some added stability at the strategic or nuclear level, they may exacerbate conventional maritime arms races that could result in strategic effects via crisis escalation. In evaluating the impact of SSBNs on crisis stability, then, this thesis must also evaluate the problems improved fast attack submarine fleets may pose. While Western analysis tends to focus on their deterrent effect, submarines have historically been used to great effect for commerce raiding and naval blockades. Pakistan especially remains vulnerable to a blockade of Karachi, which occurred during the 1971

¹² I follow John Mearsheimer's definitions of inadvertent and accidental escalation: "'Inadvertent escalation' refers to deliberate nuclear escalation, ordered by national command authorities (NCAs) on one side, which is inadvertently provoked by actions of the other side. In contrast, 'accidental escalation' arises when individual commanders use nuclear weapons, in accordance with their rules of engagement, before NCAs on either side have decided to go to nuclear war." Given the limited technical skills and experience of these states' submarine services, I also allow for the potential for mechanical failure and unauthorized use of weapons under the rubric of accidental escalation. John J. Mearsheimer, "A Strategic Misstep: The Maritime Strategy and Deterrence in Europe," *International Security* 11, no. 2 (Fall 1986): 15n19.

War. This fear has led Pakistan to set economic strangulation as a red line that could generate a nuclear response. The peacetime use of submarines for commerce raiding is unlikely, but cannot be ruled out. Provocative behavior toward ballistic missile submarines could also generate risk of escalation. Relatively small fleet sizes mean that any given submarine is more valuable than its Cold War counterparts were, and it is unknown how India would react if its submarines were subject to ASW efforts.

The crisis stability challenges posed by the introduction of *Arihant* are both external, as just described, and internal to India. The introduction of nuclear-powered submarines creates huge bureaucratic and cultural demands on their navies as they attempt to move away from diesel toward nuclear. There are significant technical and doctrinal issues that India has not addressed, at least publicly. The degradation of command and control is especially problematic for submarines: who retains launch authority if a submarine loses contact with the national command authority? India has a strong tradition of civilian control of the nuclear arsenal, and Indian nuclear weapons are believed to be kept demated and not available for immediate use. An SSBN, however, must carry both warheads and missiles. The logic of predelegation that plagues tactical nuclear weapons is relevant to SLBMs as well; one cannot avoid some level of predelegation if the system is to be effective, but predelegation introduces new opportunities for the misuse of weapons. India has not yet explained how it intends to retain active civilian control over its SLBM arsenal.

This thesis should not be understood as an argument against sea-based deterrence; rather, it is an effort to understand when and how sea-based deterrence can bolster strategic stability. The Cold War is a single case, but many analysts and strategists have abstracted from it to create reductive principles that may not apply in all cases. I argue that SSBNs must be understood in their operational, bureaucratic, and technological contexts. Furthermore, discussing SSBNs without discussing ASW, specifically SSNs, is dangerous and leads to faulty conclusions about the security and credibility of a state's second strike.

D. LITERATURE REVIEW

This thesis draws on and synthesizes two primary literatures: nuclear deterrence in the maritime domain and India's strategic relationship with Pakistan and China, with an emphasis on maritime security issues and nuclear deterrence.

1. Nuclear Deterrence at Sea

Sea-based deterrents received some attention during the latter half of the 20th century, but since the dissolution of the Soviet Union, there have been no significant efforts to examine whether the stabilizing nature of the Cold War-era triad can be imputed to all nuclear rivalries. In the 1950s and 1960s, the literature on nuclear deterrence argued that sea-based nuclear weapons were a valuable addition to the effort to deter nuclear attacks by the Soviet Union via the threat of massive retaliation. In *Strategy in the Missile Age*, Bernard Brodie argued that nuclear submarines capable of launching Polaris missiles “would seem to be a desirable supplement to a well-protected, land-based force, even if it proved to be ... a costlier method in relation to effects achieved.”¹³ Submarines, he noted, are hard to detect and thus difficult to target in a counterforce attack, leaving submarines free to retaliate in the event of a first strike. In an article discussing the possibilities for arms control, Thomas Schelling emphasized the importance of stabilizing deterrence, arguing that both sides had “a common interest in reducing the advantage of striking first, simply because that very advantage... increases the likelihood of war.”¹⁴ He noted that SSBNs could be either “peculiarly good at surviving and retaliating,” thereby making them a deterrent, or “peculiarly good at getting up close for a no-warning strike on an enemy's retaliatory power,” and thus destabilizing, but generally concluded that submarines bolstered deterrence.¹⁵ In *The Delicate Balance of Terror*, Albert Wohlstetter cautioned against “[looking] for miracles” in new delivery

13 Bernard Brodie, *Strategy in the Missile Age* (Princeton, NJ: Princeton University Press, 1959), 286.

14 Thomas C. Schelling, “Reciprocal Measures for Arms Stabilization,” *Daedalus* 89, no. 4 (1960): 894.

15 Ibid., 897.

systems, and laid out the hurdles any given system must overcome.¹⁶ He noted the command and control problem that SSBNs would face, but was generally positive about the mobility and stealth of the submarine as a stabilizing element.

While the early Cold War nuclear strategists by and large concluded that the SSBN offered an assured second-strike capability that minimized the incentive for first use and thus stabilized deterrence, later writers acknowledged that this abstract ideal must be balanced against the reality that submarines presented significant potential for crisis instability. Barry Posen's 1982 article, "Inadvertent Nuclear War? Escalation and NATO's Northern Flank," explored the idea that conventional operations in the vicinity of a Soviet SSBN bastion could generate escalatory pressure if these systems were threatened or targeted.¹⁷ Preemptive defensive actions by NATO could be considered offensive by the Soviets, particularly if strategic forces were in the line of fire.¹⁸ The fog of war would only compound the potential for inadvertent escalation. Desmond Ball also called out the relative inattention to the challenges of escalation control at sea, noting the reasons for the oversight and detailing a range of considerations that warrant greater analysis in South Asia, including accidents at sea, the attractiveness of ships as nuclear targets, the launch autonomy of naval commanders, and problems raised by dual-capable systems and platforms.¹⁹ John Mearsheimer argued that the U.S. Navy's Maritime Strategy of the early 1980s, which called for a 600-ship navy capable of offensive action in Europe, did not contribute to deterrence stability. Rather, he concluded that the aggressiveness of the Navy's posture may actually detract from deterrence in Europe, particularly the dangerous plan to use SSNs as counterforce assets to strike SSBNs early in a conventional war so as to shift the strategic balance.²⁰ This was not intended to suggest that SSBNs were destabilizing, however; rather, Mearsheimer cautioned the

16 Albert Wohlstetter, *The Delicate Balance of Terror*, P-1472 (Santa Monica, CA: RAND Corporation, 1958), <http://www.rand.org/about/history/wohlstetter/P1472/P1472.html>.

17 Barry R. Posen, "Inadvertent Nuclear War?: Escalation and NATO's Northern Flank," *International Security* 7, no. 2 (Fall 1982): 28.

18 Ibid., 32.

19 Desmond Ball, "Nuclear War at Sea," *International Security* 10, no. 3 (Winter 1985): 3–31.

20 Mearsheimer, "A Strategic Misstep," 5.

Navy not to take actions that could be interpreted as an attempt to erode the mutual vulnerability that created strategic stability.

Outside the U.S.-Soviet dyad, no comprehensive theoretical work on the effect of sea-based deterrents on strategic stability has been done. There was little debate about the nuances of naval nuclear weapons through the 1990s and the early 2000s, beyond an article by Robert Glasser revisiting Schelling's point that SSBNs could be used for decapitation strikes and therefore may be less stabilizing than previously thought.²¹ There has been a recent uptick in scholarly interest as a result of China's advances in submarine technology, though the problem has not yet been examined at the operational and tactical level as Mearsheimer and Posen did in the 1980s. Rather, the current analyses have focused on net assessment of China's capabilities, its intentions for its submarine fleet, and the implications of these advances for the United States. There have been few rigorous attempts to determine how China's SSBNs might impact the force postures or activities of various potential adversaries other than the United States.²²

India's nuclearization of its fleet has attracted some limited scholarly attention, but all authors seem to proceed from the foundational assumption that SSBNs should generate strategic stability; their concerns are primarily related to the escalatory potential of crises. The most notable of this body of work is Iskander Rehman's 2012 article, "Drowning Stability: The Perils of Naval Nuclearization and Brinkmanship." Focused on India and Pakistan, Rehman examined the motivations for the pursuit of sea-based nuclear weapons; these nations' "dangerous path" of dual-use systems, cultivated

21 Robert D. Glasser, "Enduring Misconceptions of Strategic Stability: The Role of Nuclear Missile-Carrying Submarines," *Journal of Peace Research* 29, no. 1 (February 1992): 23–37.

22 For force posture assessments, see Michael S. Chase, "China's Transition to a More Credible Nuclear Deterrent: Implications and Challenges for the United States," *Asia Policy* 16, no. 1 (2013): 69–101. For net assessments and intentions, see Lyle Goldstein and William Murray, "Undersea Dragons: China's Maturing Submarine Force," *International Security* 28, no. 4 (Spring 2004): 161–96; Owen R. Cote, Jr., *Assessing the Undersea Balance Between the U.S. and China*, MIT Security Studies Program Working Paper (Cambridge, MA: MIT, February 2011), http://web.mit.edu/ssp/publications/working_papers/Undersea%20Balance%20WP11-1.pdf; Sam Bateman, "Perils of the Deep: The Dangers of Submarine Proliferation in the Seas of East Asia," *Asian Security* 7, no. 1 (2011): 61–84; Thomas M. Skypek, "China's Sea-Based Nuclear Deterrent in 2020: Four Alternative Futures for China's SSBN Fleet," in *A Collection of Papers from the 2010 Nuclear Scholars Initiative* (Washington, DC: Center for Strategic and International Studies, 2010); Toshi Yoshihara and James R. Holmes, *Red Star over the Pacific: China's Rise and the Challenge to U.S. Maritime Strategy* (Annapolis, MD: Naval Institute Press, 2010).

ambiguity, and brinkmanship; and the potential for regional destabilization and inadvertent escalation.²³ In Yoshihara and Holmes' *Strategy in the Second Nuclear Age*, Andrew Winner sketched the outlines of how India's deployment of nuclear weapons at sea relates to its broader strategy.²⁴ He explored how India's SSBNs might impact deterrence with Pakistan and China, but did not delve into the interaction between crisis management and command and control issues. Winner argued that *Arihant*, armed with the K-15, "features characteristics that qualify it as a stabilizing agent in a nuclear dyad," at least until longer-range missiles are available. He neglected, however, to consider fully the potential for incidents at sea to generate escalatory pressure, nor did he draw any general conclusions about the value of nuclear triads in the IOR or examine the implications of limited delivery systems.

2. Indo-Pakistani and Sino-Indian Maritime and Nuclear Security Dynamics

There has been a marked rise in scholarly interest in security dynamics in the Indian Ocean over the last decade as India and China have invested heavily in the development of their navies, though there has not yet been a sustained effort to analyze the underwater dimension of naval or nuclear security in the IOR. Nevertheless, such works as Robert Kaplan's *Monsoon*, Bernard Cole's *Asian Maritime Strategies: Navigating Troubled Waters*, Vijay Sakhuja's *Asian Maritime Power in the 21st Century*, and editors John Garofano and Andrea Dew's *Deep Currents and Rising Tides: The Indian Ocean and International Security* argue for the renewed economic and geopolitical importance of the Indian Ocean region, underscoring the importance of maintaining access to the global commons and freedom of maritime trade. Some of these works, particularly Part II of *Deep Currents*, touch on the potential for maritime conflict to generate broader regional instability, but none directly address how changes in the undersea domain could escalate horizontally.

23 Iskander Rehman, "Drowning Stability: The Perils of Naval Nuclearization and Brinkmanship in the Indian Ocean," *Naval War College Review* 65, no. 4 (Autumn 2012): 65.

24 Andrew C. Winner, "The Future of India's Undersea Nuclear Deterrent," in *Strategy in the Second Nuclear Age: Power, Ambition, and the Ultimate Weapon*, ed. Toshi Yoshihara and James R. Holmes (Washington, DC: Georgetown University Press, 2012).

There is a rich literature on Indo-Pakistan nuclear security dynamics, which will underpin this thesis's efforts to understand how naval nuclearization may alter the deterrent relationship between these countries. The overwhelming, if not exclusive, focus of this literature is land-based crises, however; there are few high-quality sources on the maritime dimensions of Indo-Pakistani relations, nuclear or otherwise, other than those noted in the previous section. Of the land-oriented analyses, Sumit Ganguly and Paul Kapur's *India, Pakistan, and the Bomb: Debating Nuclear Stability in South Asia* is particularly valuable for this thesis. The authors present process-versus outcome-based approaches to the study of crises and why they do or do not escalate. The body of literature on escalation control in South Asian crises will be especially valuable, though again, it does not generally address escalation pathways for potential maritime crises. This literature has tended to concentrate on the possibility of limited conventional war under the nuclear umbrella, the stability-instability paradox, and the mechanisms by which land-based crises, particularly terrorist attacks, could escalate to nuclear exchanges.²⁵

The Sino-Indian nuclear relationship has also generated a body of work, though it is largely descriptive and less analytical or operationally-oriented than that of the India-Pakistan dyad. It is generally understood that India's decision to acquire nuclear weapons was driven in part by its experience in the disastrous 1962 Sino-Indian war, and concern about Chinese intentions has undergirded Indian nuclear thinking since then. The National Bureau of Asian Research's *Strategic Asia* series has published several chapters that explore various elements of the evolving Sino-Indian deterrent relationship, but none

25 Examples include Michael Krepon and Julia Thompson, eds., *Deterrence Stability and Escalation Control in South Asia* (Washington, DC: Stimson Center, 2013); Manpreet Sethi, "Conventional War in the Presence of Nuclear Weapons," *Strategic Analysis* 33, no. 3 (2009): 415–25; Forrest E. Morgan et al., *Dangerous Thresholds: Managing Escalation in the 21st Century* (Santa Monica, CA: RAND Corporation, 2008); Feroz Hassan Khan, "Challenges to Nuclear Stability in South Asia," *The Nonproliferation Review* 10, no. 1 (2003): 59–74; Scott D. Sagan, *Inside Nuclear South Asia* (Stanford, CA: Stanford Security Studies, 2009); George Perkovich, *The Non-Unitary Model And Deterrence Stability In South Asia* (Washington, DC: Stimson Center, 2012).

directly address the question of strategic stability via sea-based deterrence.²⁶ Similarly Lora Saalman's edited volume *The China-India Nuclear Crossroads: China, India, and the New Paradigm*, in which Chinese and Indian scholars analyze a wide range of aspects of the Sino-Indian deterrent relationship such as objectives for and beliefs about nuclear weapons, does not address the sea-based deterrence question.

E. METHODS AND SOURCES

In this thesis, I examine existing notions about the stabilizing effect of sea-based deterrents to determine what conditions supported strategic stability in the Cold War. This analysis will inform a closer look at how India's pursuit of a ballistic missile submarine fleet might affect arms race stability and crisis stability vis-à-vis Pakistan and China. This thesis offers some predictions for the direction of regional politics should these countries' submarine programs move forward. I use these dyads to evaluate the existing nuclear deterrence literature and theory regarding sea-based nuclear weapons. Close examination of the Indian Ocean rivalries and the assumptions underpinning the belief in SSBNs as stabilizing forces provide a more nuanced understanding of the deterrent value of these systems.

I draw on a variety of sources, including scholarly journals, policy papers, newspaper articles, government reports, official histories and doctrines, and academic books on developments in submarine proliferation in the IOR and the historical and evolving deterrent relationships between India and China and India and Pakistan. In addition to the literatures discussed in Section Four, I will draw on such works as the 2007 Indian Maritime Strategy document, *Freedom to Use the Seas: India's Maritime Military Strategy*; Rear Admiral Raja Menon's *A Nuclear Strategy for India*; and the Indian Navy's official histories as source material on Indian thinking about nuclear weapons and their integration into maritime and naval strategy. I also engage the Cold

²⁶ These include Gaurav Kampani, "India: The Challenges of Nuclear Operationalization and Strategic Stability," in *Asia in the Second Nuclear Age*, ed. Ashley J Tellis, Abraham Denmark, and Travis Tanner, Strategic Asia 2013–14 (Seattle: National Bureau of Asian Research, 2013); Arun Sahgal, "China's Military Modernization: Responses from India," in *China's Military Challenge*, ed. Ashley J Tellis and Travis Tanner, Strategic Asia 2012–13 (Seattle: National Bureau of Asian Research, 2012); as well as several chapters in Ashley J. Tellis, Travis Tanner, and Jessica Keough, eds., *Asia Responds to Its Rising Powers: China and India*, Strategic Asia 2011–12 (Seattle: National Bureau of Asian Research, 2011).

War-era literature on the history and role of sea-based nuclear weapons in the U.S.-Soviet relationship to explore the foundations of the belief in the stabilizing effect of nuclear-armed submarines as well as the empirical realities.

F. THESIS OVERVIEW

This thesis is organized into six chapters, including the introduction and conclusion. I begin with an in-depth discussion of the United States' Cold War experience, which generated the intellectual underpinnings of the belief in the deterrent value of SSBNs. I use the empirics of the Cold War to clarify the conditions that contributed to stability in the U.S.-Soviet Union dyad. I first address the internal challenges the United States Navy had to overcome in order to make its delivery systems credible and reliable, and then I examine the issues of crisis stability and arms race stability during the Cold War. I then turn to India's motivations for building an SSBN and discuss the progress they've made thus far. Following a discussion of India's capabilities, I address the India-China dyad and the India-Pakistan dyad, focusing on arms race stability and crisis stability in each dyad. I conclude by exploring the implications of my findings both for the conventional wisdom about nuclear triads and regional security in the IOR.

II. DETERRING WAR BETWEEN THE U.S. AND U.S.S.R.

During the Cold War, American and Soviet submarines chased one another across the North Atlantic. As naval nuclear propulsion technology matured, submarines gained the ability to stay underwater—and thus largely undetectable—for several months at a time while offering greater speed and a truly global reach. Fast attack submarines (SSNs) filled a range of roles, primarily ASW, defense of sea lines of communication (SLOCs) and intelligence, surveillance, and reconnaissance (ISR) missions, while fleets of ballistic missile submarines (SSBNs) offered the assurance of a second strike in the event of nuclear attack. That secure second-strike capability was thought to cement mutually assured destruction, thus stabilizing the U.S.-Soviet deterrent relationship.

By the end of the Cold War, the idea that ballistic missile submarines provided a critical deterrent function had remained intact since its initial conception in the 1950s, and now forms one of the central assumptions of nuclear strategy: submarine-based deterrents are stabilizing and thus desirable. Unpacking this assumption and exploring whether it is indeed a universal truth requires a close examination of the history of the U.S.-Soviet dyad. As will be demonstrated, the gains to strategic stability provided by SSBNs during the Cold War came with the increased potential for crisis instability and accidental or inadvertent escalation. Furthermore, SSBNs appeared to do little to restrain the broader strategic arms race, either in terms of warheads or delivery systems.

This section examines the Cold War-era theoretical foundations of sea-based nuclear deterrence as well as the development of the American nuclear fleet and the changes to America's submarine culture and force posture. I trace the development of the belief in the value of the nuclear triad alongside the development of the ballistic missile submarine. I then present an alternate explanation for the U.S.'s embrace of the nuclear triad by exploring the Cold War history of the U.S. Navy and its efforts to retain bureaucratic power and strategic significance in an era characterized by a belief in air power and fears of ground invasion. The accession of nuclear powered submarines into the fleet required significant cultural changes within the U.S. Navy and generated substantial changes to its ASW strategies, both of which were critical to the stabilization

of deterrence during the Cold War. In the following section, I investigate several examples where submarines exacerbated crises or could have generated inadvertent escalation, culminating in a discussion of the Maritime Strategy of the 1980s. I conclude with a discussion of the effects that the introduction of SSBNs had on arms race stability and proliferation of undersea warfare assets.

The historical analysis presented here will demonstrate that contrary to popular assumptions, sea-based deterrence had serious flaws from the outset. The four major challenges detailed earlier—bureaucratic and organizational change, the advancement of ASW, operational and geostrategic realities, and naval and nuclear doctrine and strategy—were present in varying degrees throughout the Cold War. The subsidiary list of problems was long and troubling: problems of predelegation and command and control; the potential for aggressive ASW behavior to generate inadvertent escalation; the potential for accidents at sea to be perceived as intentional and therefore to be considered escalatory; doctrinal mismatches between adversaries; the fear of bolt-from-the-blue attacks delivered by submarine; and, until the early 1970s, no shared framework for responding to incidents at sea.²⁷ These same problems may reappear in the IOR, as will be explored in subsequent chapters; indeed, given the players' complicated histories and growing asymmetries in military capacity, these problems are like to be even more pronounced in the South Asian context. Far from offering hope for South Asia, the Cold War illustrates the range of challenges faced by nations operating sea-based deterrents.

A. DETERRENCE THEORY AND THE NUCLEAR TRIAD

After the detonation of the first thermonuclear device in 1952, the central challenge for nuclear strategists lay in devising a way to prevent a catastrophic first strike. The solution was the development of a secure second-strike capability that would engender deterrence by punishment. Any first strike would be assured of a retaliatory nuclear response, which would theoretically outweigh any benefits to be gained by striking first and thus make a first strike less likely. As long as a preemptive strike could destroy the enemy's entire nuclear force before the enemy could respond, or at least limit

²⁷ Ball, "Nuclear War at Sea."

the potential for retaliation by significantly eroding an enemy's second-strike capability, a first strike could remain an attractive option for military planners. Strategic stability, which would be achieved when neither side had an incentive to go first, could only be possible with an assured second-strike capability. Strategic assets either had to be hardened so as to be more difficult to destroy or they had to be mobile and concealable so they would be difficult to target. The goal was to ensure that the first mover could not be sure they had eliminated the threat of retaliation. The cost of failing to destroy the adversary's nuclear arsenal through a counterforce first strike was high, the logic went; no rational actor would risk it if it was difficult to find and destroy the weapons. Bombers offered mobility, of course, but getting them in the air before a first strike could land would require sufficient advanced warning of incoming missiles—a serious technological challenge at the time.

In the early 1950s, inter-service battles raged in the Pentagon over who would control America's new atomic weapons—and, by extension, who would receive budgetary primacy and control of an important new component of national strategy. In 1954, President Eisenhower established the Technological Capabilities Panel of the Science Advisory Committee, chaired by James R. Killian, to determine the optimal make-up of the national nuclear force. The Killian Report, forwarded to the president in 1955, recommended a three-pronged approach to the development of nuclear missiles: prioritize development of the Atlas intercontinental ballistic missile (ICBM), develop an intermediate-range ballistic missile (IRBM), and develop an IRBM that could be launched from a ship at sea. Ballistic missiles at sea would be hard to find and target in a hypothetical first strike, and could thus provide the assured second strike that ensured strategic stability. Submarines were especially hard to detect, and could maintain a reserve of weapons at sea that would be secure from a first strike.

This logic was enshrined in the deterrence literature that developed in the 1950s and 1960s. Many of the leading intellectual lights of the era supported the idea of SSBNs as a positive development in the search for deterrence stability. The need for a second-strike capability was paramount, as neither side could feel secure without it. Bernard Brodie argued that even if their cost-to-effect ratio was higher than a land-based asset,

submarines armed with Polaris missiles were a valuable addition to the arsenal for their ability to assure a second strike.²⁸ Thomas Schelling warned that submarines could seem more threatening to an adversary—submarines could potentially approach enemy territory without being detected, thus providing less warning time during a counterforce first strike—but on balance believed SSBNs could provide the assured retaliation capability that would ameliorate the first-strike advantage dilemma.²⁹ Albert Wohlstetter also looked favorably on the SSBN, though he noted the command and control problem that SSBNs would face.³⁰

The push toward submarine-based nuclear weapons was not without opposition within the Navy, but as congressional pressure mounted and national intelligence estimates warned of the Soviets' progress in guided missile development, the Eisenhower administration ordered the military to begin work on these three recommendations. While the Air Force believed that any war with the Soviet Union would be vanishingly short and carried out by strategic bombing, Chief of Naval Operations Admiral Arleigh Burke argued for more flexibility in limiting the scope of conflict. He perceived that a total nuclear war would be self-defeating, and saw a role for the Navy in deterring, rather than fighting, nuclear war under a concept of "finite deterrence."³¹ Burke also saw that deterrence required not an endlessly large supply of nuclear weapons, a goal the Air Force seemed intent on pursuing, but instead a secure arsenal that would be available when needed. As George Baer explained, "A mobile, concealed, second-strike retaliatory missile force, of which the sea-based Polaris was the exemplar, would be sized not to hit every target imaginable, nor to win a war—a false goal in the nuclear age—but to have deterrence value alone. This force could be small if it were hidden and invulnerable."³² The Polaris missile, the solid-fuel, sea-based IRBM promoted by the Killian Report, would thus take center stage for the Navy.

28 Brodie, *Strategy in the Missile Age*, 286.

29 Schelling, "Reciprocal Measures for Arms Stabilization."

30 Wohlstetter, *The Delicate Balance of Terror*.

31 George W Baer, *One Hundred Years of Sea Power* (Stanford, CA: Stanford University Press, 1993), 355.

32 Ibid.

In 1955, Burke appointed Admiral William F. Raborn, Jr., to oversee the development of the Polaris missile. Polaris enabled the Navy to break the Air Force's stranglehold on strategy and resources, but its development came at the expense of other shipbuilding and maintenance projects. It also required the Navy to embrace countervalue targeting, which it had earlier condemned as unlikely to produce a political victory worth winning. Nevertheless, the Navy proceeded with the development of Polaris alongside the development of the nuclear submarine under Rear Admiral Hyman G. Rickover, whose first boat, USS *Nautilus*, went to sea in January 1955. By 1961, USS *George Washington*, a converted nuclear attack submarine, had successfully launched the Polaris from underwater, and was sent to sea with a full complement of missiles. The next class of SSBNs, the *Ethan Allen*, was commissioned into the fleet in August 1961; within 20 years, the Navy was operating 41 ballistic missile submarines.

B. BUREAUCRATIC AND ORGANIZATIONAL CHANGE

In developing the nuclear submarine force, the U.S. Navy had to undergo two major shifts in culture and mindset in order to make the SSBN a reliable delivery system: the diesel-to-nuclear transition and the inculcation of a culture of safety. The criticality of these cultural shifts cannot be overstated; as Rear Admiral Dave Oliver bluntly stated, "Culture needs to adjust when technology changes. Otherwise people die unnecessarily."³³ The speed and power offered by nuclear propulsion gave the Navy new capabilities and new missions, but these benefits came with substantially more complex and more dangerous operational and engineering problems. The Navy had to overcome the old guard's attachment to time-tested processes that were either unnecessary or downright dangerous for nuclear submarines. The introduction of nuclear submarines also demanded greater attention to safety and engineering; given the areas and depths in which these boats operated, it would be unlikely that a rescue operation could succeed, making it all the more important that accidents were prevented. These cultural changes were critical to the success of the nuclear submarine fleet over the next half-century, but both were hard-won.

³³ Dave Oliver, *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy* (Annapolis, Maryland: Naval Institute Press, 2014), 40.

1. The Cultural Transition from Diesel to Nuclear

While the development of the Polaris missile went relatively smoothly, the path to a secure, reliable delivery system was littered with pitfalls and problems. With the introduction of naval nuclear reactors, the submarine force had to radically—and rapidly—alter its standard operating procedures after decades of experience with diesel submarines. Admiral Oliver recalled an incident in the mid-1960s when a common standard operating procedure for a diesel boat nearly resulted in a hydrogen explosion aboard the SSBN USS *George Washington Carver*. At the time of the incident, submarine captains would order “Condition Baker” to be set when coming to periscope depth. Diesel submarines must spend much of their time operating near the surface to snorkel and recharge their batteries, increasing the likelihood of collision with surface ships. The design of diesel boats ensured that if any single watertight compartment was breached, the submarine would remain buoyant enough to survive. Under Condition Baker, all watertight compartments were to be immediately closed, thus ensuring survival in the event of a collision. To a diesel-trained crew, setting Condition Baker and charging the batteries were not at odds. When charging the batteries aboard a nuclear submarine, however, closing the compartments prevents hydrogen from circulating throughout the ship and creates a buildup of hydrogen in the battery well. At 8 percent, hydrogen spontaneously combusts with oxygen, creating enough heat to destroy the submarine. Luckily, *Carver* escaped that fate, but despite a missive to higher headquarters decrying Condition Baker for nuclear submarines, Oliver found that *Nautilus* continued to set Baker when he arrived three years later.³⁴ Oliver contends that diesel submariners and engineers generally preferred to ignore such problems rather than enact the necessary organizational changes.³⁵ He posits that USS *Scorpion*, which sunk under unknown circumstances near the Azores in 1968, may have been lost as a result of practices left over from the diesel era.

The change from a diesel to nuclear force was organizationally and professionally difficult, and required the iron-willed leadership of Admiral Hyman Rickover. Admiral

³⁴ Ibid., 41–44.

³⁵ Ibid., 45.

Rickover had promoted naval nuclear propulsion since its inception and was both the head of the Navy's nuclear propulsion program as well as the head of the Atomic Energy Commission's naval reactors division.³⁶ This dual-hatting gave Rickover unparalleled control over the nuclear submarine program; as Admiral William Crowe, Jr., described it, "He fathered the nuclear program, and never afterward relinquished the slightest authority over it."³⁷ To the submarine force, it was clear early on that the nuclear submarine was the future; Crowe recounts his squadron commander telling him in 1962 that "Everybody in [the nuclear training program], their lives are going to be wonderful. They're all going to make flag and they're all going to heaven."³⁸ Rickover personally controlled who was allowed to serve aboard nuclear submarines, and he expressly preferred candidates without submarine experience to those with diesel experience. This forced many younger diesel-trained submariners out of the force, engendering significant resentment on the part of those who remained. The elimination of diesel culture as "wrenching and painful to personal and professional relationships" but ultimately, "a necessary and farsighted tactic in Rickover's overall strategy to remake the Navy."³⁹

2. A Culture of Safety

The diesel to nuclear culture shift was accompanied by the recognition of the new dangers associated with nuclear submarines and the need for increased attention to safety. For the U.S. Navy, USS *Thresher* stands as an enduring reminder of the criticality of rigorous submarine safety procedures. On 10 April 1963, during a deep-diving exercise in the North Atlantic, *Thresher* was lost along with her entire crew of 129 men. *Thresher* was the lead boat of her class of advanced nuclear attack submarines; in 1964, Vice Admiral Grenfell described her as "the fastest, deepest-diving, quietest, and best-armed submarine ever delivered as an operating warship to any fleet."⁴⁰ Despite her

³⁶ Baer, *One Hundred Years of Sea Power*, 357.

³⁷ William J. Crowe, *The Line of Fire: From Washington to the Gulf, the Politics and Battles of the New Military* (New York: Simon & Schuster, 1993), 50.

³⁸ Ibid., 49.

³⁹ Oliver, *Against the Tide*, 46.

⁴⁰ E. W. Grenfell, "USS *Thresher* (SSN-593) 3 August 1961 – 10 April 1963," *Proceedings Magazine*, March 1964.

technological advancements, however, *Thresher* was unable to recover from a mechanical failure on board that resulted in flooding and loss of propulsion. An attempt to blow the emergency ballast tanks for a rapid ascent failed, and on 11 April, Chief of Naval Operations George W. Anderson, Jr., officially declared the *Thresher* to be lost. A Navy court conducted extensive investigations into the disaster, ultimately producing 1,718 classified pages. Congress undertook its own investigation, producing a 200-page report.⁴¹

As Dean Golembeski wrote in 1997, “what the investigations discovered, aside from the specifics of the disaster, was a catastrophic failure in the Navy’s basic approach to design, development, and testing. They pointed up a critical need for the creation and implementation of engineering standards that would be strictly observed, especially in the design and construction of complex and technologically sophisticated systems.”⁴² In designing *Thresher*, different engineering standards had been applied to the nuclear and non-nuclear components. As Grenfell noted a year after the incident, “The modern deep-diving submarine has advanced so fast that our rescue and salvage capability has dropped far behind, and it will probably be some years before we have even a rescue capability at the crush depths of the new submarine hulls. We therefore must do the best we can to insure the submarine’s ability to save herself.”⁴³

In 1964, in response to *Thresher*’s loss, the Navy established the Submarine Safety Program (SUBSAFE). SUBSAFE was charged with ensuring the safety of the fleet in all phases of a submarine’s life cycle, with an emphasis on preventing and

41 While the exact sequence of events leading to the loss of *Thresher* has never been conclusively determined, it is generally believed that a brazed pipe-joint ruptured in *Thresher*’s engine room. Ocean water immediately began to rush in, and as sailors searched for shut-off valves, the captain called for emergency ascent procedures. This included rapidly blowing the ballast tanks, but the engineers had overlooked that when gas expands rapidly, it cools; the water in the pipes froze and blocked the vent, preventing *Thresher* from ascending. Meanwhile, the leak caused a short circuit that triggered the automatic shutdown of the reactor. The loss of propulsion, the failed efforts to blow the ballast tanks, and the depth at which *Thresher* was operating meant that the ship could not surface before the engine room flooded and dragged the ship down. Below its test depth, *Thresher* imploded. See Dean Golembeski, “What Sank the Thresher?,” *Invention and Technology* 13, no. 1 (Summer 1997), <http://www.inventionandtech.com/content/what-sank-thresher-1>.

42 Ibid.

43 Grenfell, “USS *Thresher* (SSN-593) 3 August 1961 – 10 April 1963.”

recovering from flooding; mission success was not to be treated as a priority, but rather a side benefit. In the years since SUBSAFE was established, only one U.S. Navy submarine, the non-SUBSAFE-certified *Scorpion*, has been lost at sea. Additionally, among other tasks, the newly-established Submarine Safety Center in Groton, Connecticut was responsible for the development of a safety manual and new training plans. It also collected and shared information on submarine accidents and incidents, with the intent of creating a culture of transparency and accountability within the fleet.

Hyman Rickover's single-minded attention to safety was a driving force in the Americans' ability to field a safe, secure nuclear submarine force. Even before the loss of *Thresher*, Rickover recognized the shortcoming of diesel engineering for naval nuclear reactors and implemented new standards for components and parts that would come into contact with the reactor. In 1961, for example, Rickover demanded that "all nuclear systems exposed to seawater be fully welded instead of silver brazed, that all saltwater systems be fabricated to the same standards as the rest of the reactor plant, and that all joints and piping passing through the reactor compartment be welded" rather than brazed.⁴⁴ Rear Admiral Dave Oliver credits Rickover's active leadership with driving the necessary cultural changes:

I am convinced that despite the unrelenting personal attacks on him, without Rickover insisting upon dramatic change, many more of us would have died while building the nuclear-submarine force. As Rickover commented in testifying about the *Thresher* disaster, "Our problem is in the submarine staffs where nearly all of the people are nonnuclear people, some of whom have a deep resentment against the nuclear navy because it has put them out of business."⁴⁵

The establishment of SUBSAFE improved the reliability and safety of the submarine fleet, but the transition from a diesel to nuclear fleet was rocky and required significant changes to training procedures, operational practices, and, most importantly, to the mindset of the submarine force. Without these two cultural shifts, however, the

⁴⁴ Golembeski, "What Sank the Thresher?"

⁴⁵ Oliver, *Against the Tide*, 46.

U.S. Navy would have struggled to field either a credible sea-based deterrent or an attack submarine fleet that could monitor and track the Soviets' maritime activities.

C. ADVANCES IN STRATEGIC ASW

The naval nuclear reactor program was not specifically intended as a counter to the fear that the Soviets were installing nuclear weapons on their submarines; rather, Rickover pursued naval nuclearization because nuclear powered submarines would be less vulnerable to enemy ASW efforts. As Owen Cote, Jr., documents extensively in *The Third Battle: Innovation in the U.S. Navy's Silent Cold War Struggle with Soviet Submarines*, developments in ASW technology and doctrines spurred developments in submarine technology in an ongoing battle for undersea dominance. Even the early nuclear submarines demonstrated the inadequacy of existing ASW capabilities and doctrines. When the U.S. Navy's ASW forces first encountered *Nautilus* in exercises in 1955, they were completely outmatched, and *Nautilus* was able to make simulated attacks on 16 ships. According to Cote,

[*Nautilus*] was hard to find because she never had to snorkel and so fast that active sonars couldn't keep their beams focused on her. Her speed and three dimensional maneuverability also allowed her to simply outrun existing homing torpedoes, the design basis threat for which was a snorkeling diesel traveling at no more than 8 knots and maneuvering in only two dimensions. In short, she completely undermined almost all the ASW progress made in the previous 10 years.⁴⁶

The one saving grace for efforts to detect nuclear submarines was, and remains, the noise factor. The constant operation of reactor coolant pumps and other machinery meant that early nuclear submarines were extremely loud compared to the diesel boats that had preceded them. Discoveries in low-frequency sound propagation in the early 1950s led to the implementation of the U.S. Navy's Sound Surveillance System (SOSUS), a network of seabed arrays deployed to listen for submarines. Nuclear submarines gave greater urgency to the development of passive acoustic measures and the advancement of hunter-killer SSNs and air-based ASW assets. By 1958, when the Soviet Union began to field its

⁴⁶ Owen R. Cote, Jr., *The Third Battle: Innovation in The Navy's Silent Cold War Struggle With Soviet Submarines*, Newport Papers 16 (Newport, RI: U.S. Naval War College Press, 2003), 21.

first complement of nuclear submarines—the Hotel-class SSBNs, Echo-class SSGNs, and November-class SSNs, colloquially known as the HENS—the U.S. Navy had an ASW advantage that allowed the U.S. to keep tabs on Soviet submarine movements. SOSUS could detect the early nuclear submarines at extreme distances; the first SOSUS array to detect a Soviet submarine crossing the Greenland-Iceland-UK (GIUK) gap was located in Barbados.⁴⁷ SOSUS arrays improved dramatically over the next several decades; in the late 1980s, there were reports that the Navy could locate a submarine within a radius of about 90 kilometers, an area searchable by a single P-3C *Orion* ASW aircraft.⁴⁸

While Rickover may not have originally intended his nuclear submarine force to concern itself with counterforce missions against Soviet SSBNs, the Navy’s pursuit of improved ASW and counter-ASW capabilities highlights the reality that the introduction of SSBNs generates demand for conventional assets. Qualitative improvements in submarine technology create demand for improved ASW abilities, and vice versa. Over the next several decades, both the U.S. Navy and the Soviet Navy invested heavily in quieting technology for their submarines as well as in improved ASW capabilities intended to track and, if necessary, kill their adversary. In the 1960s, the U.S. adopted a barrier strategy, in which SOSUS arrays could alert forward-deployed SSNs and air assets when Soviet submarines crossed certain chokepoints, such as the GIUK gap. According to Cote, however,

The main challenges to the U.S. Navy’s ASW posture... turned out not to be the one that was most feared—the truly quiet nuclear submarine. Instead, the Navy was surprised to varying degrees during this period by fast, deep-diving submarines (Alfa and Papa); submerged launch, antiship missile submarines (Charlie I and II SSGNs); and the long-range, ballistic missile submarines (Delta SSBNs).⁴⁹

Introduced in 1973, the Delta SSBN was especially threatening because it did not have to leave Soviet waters to pose a threat to the American homeland. The Deltas carried the R-29 (in NATO parlance, SS-N-8) family of missiles. These 3,500-4,500 mile

⁴⁷ Ibid., 39.

⁴⁸ Richard W. Fieldhouse and Shunji Taoka, *Superpowers at Sea: An Assessment of the Naval Arms Race*, SIPRI: Strategic Issue Papers (Oxford: Oxford University Press, 1989), 71.

⁴⁹ Cote, Jr., *The Third Battle*, 46.

range SLBMs “caused a fundamental shift in the U.S. Navy’s approach to strategic ASW, one that caused a major expansion in the role of its SSN force.”⁵⁰ Until the Delta, the U.S. had been relatively confident in its ability to find and target Soviet submarines. The ranges of the earlier generations of Soviet SLBMs were such that the delivery systems would have to pass through one or more ASW barriers in order to launch an attack on the United States. The Deltas, however, did not have to pass any ASW barriers to pose a threat. Furthermore, because they could stay within range of Soviet air defense batteries, they required a different ASW posture if they were to be held at risk. Initially, the Navy made the conscious choice to avoid offensive operations near the Deltas’ patrol regions. Later, however, the Maritime Strategy of the 1980s enshrined an alternate strategy in which Soviet SSBNs would be targeted early in a crisis. Only SSNs could perform this mission, and “this fact was reflected in both force structure and platform design decisions... culminating in the 100 SSN force requirement of the 600 ship navy, and the design of the USS *Seawolf*.”⁵¹ As this history demonstrates, ASW advances generate demand for improvements in submarine technology, and vice versa. As neither side could accept vulnerability to the other’s ASW, the arms race in undersea warfare assets was gradual and incremental but persistent throughout the Cold War.

For the Cold War adversaries, the quantity of submarines in the fleet could make up for any potential loss to ASW efforts, accidents, or bureaucratic or organizational failures. As will be discussed further in Chapter IV, these challenges will loom much larger for India. With such a small fleet planned, India will be even more reliant on individual boats, making losses that much more unacceptable. The role of cultural change and the interplay between ASW and advances in submarine technology is an understudied but important element in evaluating the deterrent value of a fleet of nuclear-armed submarines.

⁵⁰ Ibid.

⁵¹ Ibid., 65.

III. COURTING DISASTER DURING THE COLD WAR

Moving beyond the internal challenges the U.S. Navy faced during the Cold War, this chapter chronologically addresses the U.S.-Soviet dyad and the four main problems associated with the introduction of SSBNs that are woven through the story of the Cold War. I focus primarily on three phases or moments of the Cold War that exemplify these problems in action: the Cuban Missile Crisis, naval parity in the 1970s and the Incidents at Sea Agreement, and the Maritime Strategy of the 1980s. While the early Cold War nuclear strategists by and large concluded that the SSBN offered an assured second-strike capability that minimized the incentive for first use and thus stabilized deterrence, it later became clear that this abstract ideal must be balanced against the reality that the submarines presented significant potential for crisis instability. The logic of deterrence made sense on the surface, but it failed to account for technological progress, the operationalization of the U.S.'s containment policy toward the Soviet Union, and the Navy's bureaucratic and cultural preference for an active role in national strategy. This history clearly illustrates that bureaucratic practices and preferences, the interplay of ASW and strategic assets, the areas in which these assets operate, and national naval and nuclear doctrine and strategy can have a serious impact on crisis stability and arms race stability.

A. THE CUBAN MISSILE CRISIS

The first intimation of the potential for nuclear-armed submarines to generate inadvertent escalation came during the Cuban Missile Crisis, though it was not well understood at the time. The discovery of Soviet missiles in Cuba in 1962 prompted the Kennedy administration to institute a selective naval blockade of the island. Kennedy and Secretary of Defense McNamara preferred a proportional approach and careful crisis management, which required the blockade be conducted only against ships carrying weapons and delivery systems; food, oil, and other goods would be allowed to pass. The Navy successfully isolated Cuba through a combination of air and naval assets. No Soviet ships attempted to run the blockade, and any freighters that might have been carrying

missiles turned away before reaching the line in the sea. Within days, Khrushchev had announced he would withdraw the missiles from Cuba. The Cuban Missile Crisis ended peacefully, and the general conclusion was that deterrence had worked.

While one could focus on the positive outcome—there was no nuclear exchange—a process-based approach, through which one examines the processes by which a crisis develops, shows the potential for disaster that lurked underwater.⁵² An outcome-oriented approach overlooks the dangers inherent in operating nuclear-armed submarines near enemy ships, and the Cuban Missile Crisis provides a clear example of the potential for inadvertence resulting from predelegation and communication challenges. During this period, four Soviet Foxtrot-class diesel attack submarines were operating in the area around Cuba. Deployed from the Soviet Northern Fleet to establish a submarine base at Mariel in Cuba, these four submarines were loaded with both conventional and nuclear-tipped torpedoes. They had departed the Soviet Union on October 1, a full two weeks before the United States discovered the missiles in Cuba, and their commanders had been given the authority to decide whether to use nuclear weapons in the event they came under attack.⁵³

On October 24, the U.S. Navy issued a notice via the State Department to “other Governments” that detailed the procedures the Navy would follow in surfacing and identifying submarines operating near the quarantined area. These procedures included dropping “four or five harmless explosive sound signals” which would indicate to submerged submarines that they should surface and be identified.⁵⁴ According to a December 1962 Soviet report enumerating the experiences of these submarines, however, “practically on every bandwidth, interference transmitters were turned on at the start of transmission of information from Moscow, which resulted in delays of reception of

⁵² For more on outcome- versus process-based approaches to crisis behavior, see Sumit Ganguly and S. Paul Kapur, *India, Pakistan, and the Bomb: Debating Nuclear Stability in South Asia* (New York: Columbia University Press, 2012).

⁵³ Svetlana Savranskaya, “New Sources on the Role of Soviet Submarines in the Cuban Missile Crisis,” *Journal of Strategic Studies* 28, no. 2 (2005): 240.

⁵⁴ Thomas Blanton, William Burr, and Svetlana Savranskaya, eds., “The Underwater Cuban Missile Crisis: Soviet Submarines and the Risk of Nuclear War,” in *National Security Archive Electronic Briefing Book No. 399* (George Washington University, 2012), <http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB399/>.

orders from the Headquarters of the Navy from several hours to a full day.”⁵⁵ The Soviet commanders reported never having received the Navy’s notice.

The Soviet report further noted that once the first submarine had been discovered after surfacing to repair its failed diesel engines, ASW activity was increased. The remaining three submarines were pursued vigorously, and only one managed to evade pursuit and avoid surfacing. Most troublingly from a crisis management perspective, the report states that

In the course of search and pursuit of the submarines by anti-submarine warfare forces, [the U.S. Navy] actively used explosive sources [sic] of the location systems “Julie-Jezebel,” the blasts of which are impossible to distinguish from explosions of depth bombs. It is possible that depth bombs were actually used because three of the submarines suffered damage to the parts of radio systems antennas, which made reception and transmission of information substantially more difficult.⁵⁶

While understandable from a tactical perspective, the Navy’s aggressive action against the nuclear-armed Soviet submarines, including firing torpedoes and an attempted ramming, introduced the potential for inadvertent escalation. The degradation of the submarines’ communication capabilities meant that Moscow could not exercise effective command and control of its submarines even as it attempted to keep the crisis from spiraling into nuclear war. Ryurik Ketov, captain of one of the Soviet submarines in the Sargasso Sea, later reported that “mere chance” prevented one commander from resorting to nuclear weapons under fire: “A delay in diving time and the prudence of the brigade’s Chief of Staff Vasilii Arkhipov—who happened to be on board—prevented the combat operations which the B-59 could have initiated.”⁵⁷ Those operations would have involved the use of nuclear torpedoes against U.S. Navy ships during a delicate and tense political

⁵⁵ USSR Northern Fleet Headquarters, *Report: About Participation of Submarines “B-4,” “B-36,” “B-59,” “B-130” of the 69th Submarine Brigade of the Northern Fleet in the Operation “Anadyr” during the Period of October-December, 1962 /CARIBBEAN CRISIS/*, trans. Svetlana Savranskaya, December 1962, <http://www2.gwu.edu/~nsarchiv/NSAEBB/NSAEBB399/docs/Report%20of%20the%20submarine%20mission.pdf>.

⁵⁶ Ibid.

⁵⁷ Ryurik Ketov, “The Cuban Missile Crisis as Seen Through a Periscope,” *Journal of Strategic Studies* 28, no. 2 (2005): 227.

situation. It is not hard to imagine that their use could have been perceived as intentionally escalatory rather than defensive.

The Cuban Missile Crisis accords with normal accident theory, which concludes that complex organizations will inevitably experience accidents as a result of organizational inconsistency and incomplete knowledge; humans are fallible and may not recognize contradictory policies in their organizations, particularly when under stress.⁵⁸ Though the outcome was, on balance, positive, the Cuban Missile Crisis also underscores the dangers posed by insufficient attention to naval doctrine and strategy; for the U.S. Navy, enforcing the blockade took precedence over higher-order concerns about maintaining crisis stability. Rather than nuclear-armed submarines engendering caution in either the U.S. Navy or the Soviet Union, this episode suggests that neither party gave serious consideration to the potential for inadvertent escalation as a result of aggressive ASW efforts or the command and control problems that would be faced by national control authorities and submarine commanders under hostile conditions. As the Indian Navy grows and gains bureaucratic power, India will need to match naval and nuclear strategy carefully to ensure it does not make the same mistake in the IOR.

B. NAVAL PARITY IN THE 1970S AND INCIDENTS AT SEA

By the end of the 1960s, the Soviets had achieved a submarine-launched ballistic missile (SLBM) alongside the development of the Yankee-class SSBN, which had greater mobility and could strike coastal targets. As noted earlier, in 1973 the Soviet Union fielded the R-29/SS-N-8 intercontinental ballistic missile aboard the Delta-I class submarines, which gave them the ability to hit any target in the continental United States, thus providing the Soviets with an assured second-strike capability. Unlike the Americans, the Soviets opted to keep their SSBNs close to home and under the protection of air defense assets in the Kola Peninsula. As Baer notes, by “withholding their power in

⁵⁸ For a thorough discussion of normal accident theory as it relates to complex organizations, see Scott D. Sagan, *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons* (Princeton, NJ: Princeton University Press, 1993), 28–45.

order to have decisive force on hand to influence a postwar settlement ... the Soviet SSBNs did not have to expose themselves to enemy hunters at all.”⁵⁹

Through the 1970s, Soviet naval strategy became more active as more and better ships were built. The head of the Soviet Navy, Admiral Sergei Gorshkov, was committed to standing against “the ocean strategy of imperialism”⁶⁰ Within the broad American defense strategic community, there was debate about whether the Soviet policy was intended to be aggressive or was simply defensive and designed to reach parity with the United States. The Soviets’ lack of clarity about doctrine led to misperceptions and confusion within the United States defense community. The U.S. Navy, for its part, looked at Soviet capabilities and saw a clear threat to sea lines of communication. During the Cold War, the Navy’s fear had little strategic effect—the broader strategic community continued to believe that any military conflict with the Soviet Union would be too short for SLOCs to matter much to the war effort. Had there been greater concern for SLOC security, however, it is likely that the U.S.’s ASW assets would have received significant additional resources. In South Asia, particularly between Pakistan and India, SLOC security is less of an immediate concern in a crisis, but the same principle applies: if the state fears its adversary’s naval strategy to be aggressive, it will endeavor to equip itself for that fight, with potentially deleterious effects on crisis stability.

Throughout the rest of the 1970s, the Navy struggled with questions of mission, force structure, and strategic focus. Old ships were scrapped even as inflation made new ships unaffordable, and the fleet shrunk alarmingly. The only platforms spared from this process of downsizing were the nuclear submarines. The SSBN fleet held steady at 41, while the SSN fleet grew to 61 ships by the mid-1970s. As American ships aged and funds could not be found to replace them, the Navy saw itself facing a formidable foe and cautioned political leaders not to exert diplomatic pressure in areas where the local Soviet forces outnumbered the U.S. Navy, lest the United States be forced to back down as the Soviets had in Cuba.

⁵⁹ Baer, *One Hundred Years of Sea Power*, 397.

⁶⁰ S. G. Gorshkov, *The Sea Power of the State* (Oxford: Pergamon, 1979), 284, quoted in *Ibid*.

In 1972, the U.S.-Soviet Prevention of Incidents On and Over the High Seas Agreement (commonly referred to as the Incidents at Sea Agreement) was signed amid concerns about increasing naval parity. The threat posed by the Soviet fleet forced the Navy to consider whether it would be able to control escalation to nuclear use in the event of a conflict or confrontation. The Soviets also acknowledged the potential for escalation as a result of accidents or aggressive tactics that led to open fire. The U.S. Department of State describes the Incidents at Sea Agreement as a confidence-building measure, and notes that as such, “[it] does not directly affect the size, weaponry, or force structure of the parties. Rather, it serves to enhance mutual knowledge and understanding of military activities; to reduce the possibility of conflict by accident, miscalculation, or the failure of communication; and to increase stability in times of both calm and crisis.”⁶¹ Through the Incidents at Sea Agreement, the United States and the Soviet Union committed to following the “rules of the road” that governed ship movements in international waters. In addition to the general Article II commitment regarding the observation of established international regulations, Article III presented a list of specific agreements designed to ensure that ambiguous actions by military vessels would not be misinterpreted as hostile or escalatory. Per the U.S. Department of State, “the agreement provides for:

- steps to avoid collision;
- not interfering in the “formations” of the other party;
- avoiding maneuvers in areas of heavy sea traffic;
- requiring surveillance ships to maintain a safe distance from the object of investigation so as to avoid ‘embarrassing or endangering the ships under surveillance’;
- using accepted international signals when ships maneuver near one another;
- not simulating attacks at, launching objects toward, or illuminating the bridges of the other party’s ships;

⁶¹ Bureau of Public Affairs Department Of State. The Office of Website Management, “Incidents at Sea Agreement,” Other Release, *U.S. Department of State*, (January 1, 2004), <http://www.state.gov/t/isn/4791.htm>.

- informing vessels when submarines are exercising near them; and
- requiring aircraft commanders to use the greatest caution and prudence in approaching aircraft and ships of the other party and not permitting simulated attacks against aircraft or ships, performing aerobatics over ships, or dropping hazardous objects near them.”⁶²

Over time, the Incidents at Sea Agreement led to a reduction in collisions and near collisions, according to Secretary of the Navy John Lehman.⁶³ For South Asia, a similar agreement may be appropriate in the coming years. Confidence-building measures such as a shared framework for interpreting and addressing naval encounters could help mitigate the crisis instability problems generated by small fleet sizes, lack of experience with naval nuclear propulsion, and growing ASW arsenals.

C. THE MARITIME STRATEGY OF THE 1980S

The end of the 1970s had seen the Navy fruitlessly arguing the need for offensive sea power against a national strategy that saw naval power as broadly useless for the expected war in Germany, which would be too short for the Navy to get involved. In the 1980s, however, Secretary of the Navy John Lehman, Jr. and the successive Chiefs of Naval Operations (CNOs) Admirals Thomas Hayward and James Watkins constructed a case for offensive power that relied on a new concept for war with the Soviet Union. The Maritime Strategy of the 1980s and the criticisms leveled against it clearly highlight the importance of naval strategy in maintaining arms race and crisis stability. George Baer states:

Hayward, Watkins, and Lehman moved the Navy’s missions away from NATO-centered, reactive sea control and limited Third World interventionism toward a worldwide offensive in a general war. The Navy hoped that in such a war it would be able to achieve a related shift—that of national strategy away from a sharp, nuclear conflict on the European central front, toward a long, conventional maritime war of global scope. Such a maritime strategy would recommit the Navy to power-projection missions of direct air-and-amphibious support in a European land war, as

⁶² Ibid.

⁶³ Fred Hiatt, "Soviet Sub Bumps Into U.S. Carrier," *The Washington Post*, March 22, 1984, 1, quoted in Ball, "Nuclear War at Sea," 8.

well as to offensive sea control through aggressive antisubmarine warfare.⁶⁴

Such an offensive maritime strategy would, its planners believed, allow the United States to redefine the nature of a potential war with the Soviet Union by keeping the war conventional and expanding it beyond the borders of Europe. In the first moments of a war, the Navy would be on the offensive against the Soviet Union, most notably against its SSBN forces. By closing access to the oceans and destroying the Soviet fleets in port, the Navy believed it could win the war. This reconnection of sea control to power projection promoted by Lehman and the CNOs provided justification for budgetary increases as the Reagan administration beefed up defense budgets. It also offered an alternative to the consensus view that the war would be fought in Germany and would be over quickly.

Nevertheless, the maritime strategy attracted its share of critics, who attacked its fundamental assumption that a general war with the Soviet Union could stay below the nuclear threshold. The Navy believed the Soviet Union would refrain from using nuclear weapons in the early phases of a war, thereby giving it time to decimate the SSBN fleet. This was unknowable, however, and many strategists saw it as an unfounded assumption that was adopted because it gave the Navy space to argue its preferred positions.

There was also a growing recognition that escalation to the use of nuclear weapons may not be a rational, calculated decision on either side. Barry Posen's 1982 article "Inadvertent Nuclear War? Escalation and NATO's Northern Flank" argued that "intense conventional operations may *cause* nuclear escalation by threatening or destroying strategic nuclear forces."⁶⁵ Posen noted the "fine line between offensive and defensive acts," explaining that while destruction of Soviet submarines may be considered defensive by a NATO attack submarine, the Soviet Union might determine such destruction to be the first volley in an offensive campaign, particularly if the destroyed sub was an SSBN.⁶⁶ The fog of war would only compound the potential for

⁶⁴ Baer, *One Hundred Years of Sea Power*, 418.

⁶⁵ Posen, "Inadvertent Nuclear War?," 28.

⁶⁶ Ibid., 32.

inadvertent escalation. That the Navy had clearly stated its desire to hunt and kill SSBNs would lend further weight to the Soviet calculation that any accident must be an intentional first strike against its strategic reserve. The fundamental use-or-lose logic of nuclear war would be activated; the Soviet Union would have real incentive to launch before its reserves were lost.

Desmond Ball also argued for greater attention to the challenges of escalation control at sea, whether inadvertent, accidental, or intentional.⁶⁷ Ball pointed out that “the sea is the only area where nuclear weapon platforms of the U.S. and the Soviet Union actually come into physical contact” and that the problem of accidents was particularly salient.⁶⁸ Games of chicken and harassment for tactical purposes could have led to an exchange of fire, leading at best to a political crisis and at worst to active conflict. Indeed, under the Holystone program, American intelligence-gathering missions using attack submarines had resulted in a string of collisions with Soviet subs. The Holystone missions, begun under Eisenhower, reportedly gave submarine captains the authority to use their weapons, including nuclear weapons, if threatened; these weapons did not require a second authentication in order to launch.⁶⁹ While doctrinally the Navy insisted that commanders would receive positive launch authorization from the National Command Authority before any SLBMs could be launched, there were no technical or physical limitations beyond the coordination of personnel across the submarine itself. Personnel discipline was expected to constrain commanders from unauthorized launch.

John Mearsheimer further argued that this new maritime strategy did not contribute as much to deterrence stability as its authors argued. He described the strategy as having an “amorphous and elastic quality about it,”⁷⁰ underpinned by four offensive concepts: direct military impact, horizontal escalation, offensive sea control, and counterforce coercion. Mearsheimer suggested that the first two of these were red herrings. The Navy could not do sufficient damage to the Soviet homeland to justify its

⁶⁷ Ball, “Nuclear War at Sea.”

⁶⁸ Ibid., 4.

⁶⁹ Ibid., 5–6.

⁷⁰ Mearsheimer, “A Strategic Misstep,” 5.

resource demands, nor would such a capability deter the Soviets from invading Europe. Neither would an effort to broaden a war by attacking peripheral states and allies; the Soviet Union would be unlikely to divert resources to peripheral areas while intense fighting continued in Central Europe, and once it had freed up and redeployed resources, the Navy would be unable to hold on to whatever gains it might have made.

Mearsheimer argued that a defensive sea control position was optimal. Sea power could remain a key element in containing and deterring the Soviet Union by maintaining a barrier in the GIUK gap, continuing to perform ASW activities in the open ocean below the barrier to neutralize any submarines that got through, and providing ASW capabilities to convoys. Offensive sea control, on the other hand, would threaten the Soviet Union's strategic reserve under false assumptions about the military effectiveness of attacking Soviet submarines in their home waters. Mearsheimer suggested that offensive sea control and counterforce coercion were closely related in operational approach—the pursuit of Soviet submarines by American ASW assets—but that counterforce coercion was even more fundamentally problematic. While it created the possibility of inadvertent nuclear war that would follow Schelling's concept of the manipulation of risk as a deterrent, proponents of such an approach misunderstood the ways in which counterforce coercion would undermine deterrence stability even as it destroyed crisis stability entirely. Should the Soviet Union believe the sinking of a submarine was a first volley in a war, it may be inclined to respond forcefully.

Mearsheimer concluded that the maritime strategy's postures could actually detract from deterrence in Europe. He described the idea of using SSNs to strike SSBNs early in a conventional war as “destabilizing in a crisis and potentially escalatory in a conflict.”⁷¹ The budgetary resources that the Navy was demanding for its 600-ship fleet would be better spent building up NATO ground and air capabilities in Central Europe, where they would have a greater deterrent value as well as a greater war fighting value. “In the final analysis,” Mearsheimer argued, “the central question is not whether the United States can hurt the Soviets with its navy, but whether NATO can protect its

⁷¹ Ibid.

SLOCs from Soviet submarines. Sea control is the key issue.”⁷² The aggressive pursuit of Soviet submarines could not guarantee the security of the SLOCs, but it could generate escalatory pressures.

While the maritime strategy persisted within the Navy through the rest of the 1980s, its efforts to rethink America’s strategic approach to the Soviet Union were not adopted broadly. According to Baer, “what to the Navy seemed a virtue and the best way to fight a war seemed to political authorities, and to the other services, unnecessary and dangerous in the nuclear age. Few were willing to forsake the grotesque stability of deterrence to approve the Navy’s offensive strategy, or to value an actual war with the Soviet Union as an instrument of policy.”⁷³ This episode clearly demonstrates the potential for bureaucratic interests to make submarine-based deterrence dangerous by promoting offensive strategies that are destabilizing during crisis.

D. EVALUATING STRATEGIC STABILITY IN THE COLD WAR

With the peaceful collapse and dissolution of the Soviet Union, discussions about strategic stability and the effects of an aggressive maritime strategy became less urgent, though some strategists were not yet willing to let it go. Robert Glasser built on the Cold War-era work in a 1992 article titled, “Enduring Misconceptions of Strategic Stability: The Role of Nuclear Missile-Carrying Submarines.” He argued that beyond the problems of SSBNs that Mearsheimer, Posen, and Ball had identified, U.S. strategists had underestimated the “destabilizing properties” of SLBMs, which incentivize command and control decapitation strikes.⁷⁴ Furthermore, he suggested, SLBMs are prone to loss of control in crises because they lack permissive action links (PAL) and they regularly come into contact with enemy forces even in peacetime. SLBMs also complicate the problem of attributing attacks; without accurate attribution, retaliation becomes a high-stakes guessing game.

⁷² Ibid., 35.

⁷³ Baer, *One Hundred Years of Sea Power*, 438.

⁷⁴ Glasser, “Enduring Misconceptions of Strategic Stability.”

These arguments did little to undermine the U.S. Navy's continued support for the SSBN fleet. Through the 1990s and the first decades of the 2000s, America has been able to rest easy that its strategic deterrent was sufficient for any potential adversary. These conditions have led to a corresponding disinterest in the mechanisms and logic by which naval nuclear weapons can be said to provide deterrent value or the problems and challenges associated with sea-based deterrence. Within the United States, the only conversation to be found about ballistic missile submarines today is the ongoing debate about which agency should fund the *Ohio* SSBN replacement program and how few ships can be commissioned without decreasing the deterrent patrol tempo. Debate over the *Ohio* replacement is generally divorced from broader conversations about deterrence, however, focusing instead on budgets and bureaucratic power. The SSN fleet is subject to similar thinking; even as combatant commands demand greater support from submarine assets, within Congress and the Navy the conversation is about budgets and intra-service competition for resources.

Despite a multitude of incidents involving spying submarines, simulated attacks, and near-misses, at no point during the Cold War did a crisis escalate to nuclear use. Strategic stability was maintained even as crisis stability was tested. It is impossible to state conclusively that SSBNs were more stabilizing than not during the Cold War, but if SSBNs did contribute to peace, it was because the superpowers' second strike was credible and secure and thus assured. The Cold War adversaries achieved technological credibility in part through the development of naval nuclear reactors that allowed their deterrents to remain submerged and thus hard to find.

Early nuclear submarines, however, were noisy and, as noted, relatively easy to track, so nuclear propulsion and its attendant benefits cannot have been the sole driver of credibility and security. Though often overlooked in the contemporary literature and public debates, the distances involved and the quantity of delivery systems were equally important in the pursuit of credibility and security. This has serious implications for India, which will be operating a small fleet in close proximity to one of its major adversaries. Until the development of SLBMs with intercontinental ranges, distance offered some security against ASW: Soviet SSBNs would have to pass U.S. acoustic

barriers to access the open ocean and get within firing range, which gave the U.S. a greater sense of security and reduced its incentives to act aggressively against the Soviet's strategic reserve in a crisis. Cold War deterrence also rested in part on the quantity of delivery systems. By 1988, the Soviet Union fielded 77 SSBNs, while the U.S. had 36.⁷⁵ As good as American ASW was, the United States could never be entirely sure it could find and eliminate all Soviet SSBNs, particularly as quieting technologies improved. There was a certain credibility offered by these quantities; even if a few boats experienced mechanical failures or accidents, both sides could rest assured there were many others still on patrol. Especially for the Soviets, quantity obviated some of the quality problems they experienced.

1. Assessing Arms Race Stability

If nuclear proliferation optimists are correct, the acquisition of an assured second strike should be welcomed, as it would imply that any adversary would be deterred from conducting a first strike by the threat of countervalue punishment. Assuming nuclear warfighting was off the table, there would then be no need for additional land- or air-based nuclear assets, as existential security would be assured. The development of robust SSBN fleets did not seem to generate a sense of security on either side of the Cold War, however. Even as the superpowers pursued—and achieved—credible, assured, secure second-strike capabilities, they continued to develop new land- and air-based delivery systems, more advanced missiles, and better warheads. SSBNs did not prevent the United States or the Soviet Union from adopting expansive target sets and building several thousand nuclear warheads—at their peak, some estimates suggest the United States had over 23,000 devices, while the Soviets had 45,000.⁷⁶ To be sure, decisions regarding intra-country horizontal and vertical proliferation are not strictly rational. Outside influences such as bureaucratic politics, national prestige, and path dependence often conspire to generate upward pressure on arsenal size and diversity. Nevertheless, the notion that SSBNs preclude further nuclear arsenal growth is empirically unfounded.

⁷⁵ Fieldhouse and Taoka, *Superpowers at Sea*, 23.

⁷⁶ Robert S. Norris and Hans M. Kristensen, "Global Nuclear Weapons Inventories, 1945–2010," *Bulletin of the Atomic Scientists* 66, no. 4 (July 1, 2010): 81–82.

There is evidence to suggest, however, that SSBNs can generate demands for larger arsenals of conventional ASW assets, as in the United States during the late 1970s and 1980s. While in an ideal world adversaries would accept mutual vulnerability and decline to pursue one another's second-strike assets, the reality is that states seem unwilling to forgo ASW when faced with a potentially existential threat for which there might be a military solution. India is likely to experience just such a situation as Pakistan and China build up their attack submarine fleets. As noted earlier, the U.S. demand for SSNs for ASW purposes spiked dramatically after the introduction of the Delta-I class. The need to conduct intelligence gathering against new adversary submarines also drives demand for SSNs. These assets offer an additional possible vector for crisis instability. There is also the opportunity cost associated with a conventional submarine arms race. Outside of their ISR functions, attack submarines are primarily useful for blockades and high-end warfighting; they have little utility for counter-piracy operations or humanitarian assistance and disaster relief (HADR), which have been a significant part of the South Asian navies' mission sets. By purchasing more submarines, states may shift resources away from these traditional roles and thus have fewer assets available that allow for gradations of force.

2. Crisis Stability Revisited

As the Cold War experience demonstrated, national strategy and a navy's doctrines have a substantial effect on how stabilizing or destabilizing a fleet of ballistic missile submarines might be. The Cuban Missile Crisis demonstrated the problems of predelegation and command and control, along with the potential for aggressive ASW behavior to generate inadvertent escalation. Bureaucratic politics and preferences in the Department of Defense also played a significant role in generating instability. The U.S. Navy's need to remain at parity with the Air Force with regard to budgets and to national strategy drove it to adopt the risky Maritime Strategy of the 1980s. Furthermore, the desire to be part of the fight against the Soviet Union led the Navy to pursue actions and doctrines that, on balance, increased the risk of nuclear war. India is likely face similar challenges as the United States, and will need to be on guard against suboptimal bureaucratic decision-making that leads to crisis instability. India will also need to

address the question of command and control during crises, lest the ambiguity generate either unwarranted fear or overconfidence on the part of adversaries. These issues will be addressed more thoroughly in the following two chapters.

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IV. INDIA'S INTERNAL CHALLENGES AND DOCTRINES

The problems and potential sources of instability identified in the previous two chapters are not simply artifacts of the Cold War context; rather, as will be explored in the next two chapters, these are problems that are likely to recur in South Asia as well. Bureaucratic and organizational change, advances in ASW, geostrategic realities, and naval and nuclear doctrine and strategy are inescapable problems to which India must find its own solutions.

In order to understand the South Asian dyads and the potential impact of an Indian sea-based deterrent, it is necessary to begin with a brief examination of the history of India's submarine fleet, with an eye toward understanding the likelihood that the Indian Navy will be able to address the internal challenges posed by the introduction of nuclear-powered and nuclear-armed submarines into the fleet. I then expand into a discussion of India's motivations for pursuing a sea-based deterrent, as well as the problems posed for India's nuclear posture and strategy. The following chapter will explore the India-China and India-Pakistan relationships to determine the effects an Indian SSBN fleet could have on these dyads with respect to crisis stability and arms race stability.

A. INDIA'S CONVENTIONAL SUBMARINE FLEET

Since India's founding in 1947, the Navy has had some interest in submarines, though it did not acquire its first boat for another two decades. In the first plan formulated after independence, the Indian Navy proposed the acquisition of four submarines. No timetables were attached to this request, however, and the budget plan for 1948–1958 did not include the creation of a submarine branch. According to the official history of the Indian Navy, *Transition to Triumph*, “the Navy found it exceedingly difficult to carry conviction, either in India or Britain, that the Submarine Arm was a priority requirement. In the context of a non-violent, peace-loving member of the British Commonwealth whose over-riding priority was economic development, nobody was prepared to accept

that India at all needed a patently offensive Submarine Arm.” Nevertheless, Indian sailors began receiving training from the British, including service aboard British submarines.

India’s defeat by China in 1962 provided the Navy an opportunity to reopen discussion of a submarine branch, lest Chinese submarines put Indian assets in the Bay of Bengal at risk. While initial plans recommended that three submarines be purchased from Britain, British ships proved too expensive. After the United States dismissed non-aligned India’s request, India turned to Russia. Then-Deputy Chief of Naval Staff Admiral Kohli wrote, “Having tried both the USA and UK and drawn a blank from both countries, we had no alternative but to go to the Soviet Union. This decision was taken after the most careful consideration as it would mean going to the Communist camp for the first time.”⁷⁷ Despite never having trained on Russian subs, India signed an agreement with the Soviet Union in 1965, and two Indian crews were sent to Vladivostok to receive training in July 1966.

By 1968, India had acquired its first submarine, INS *Kalvari*, as well as the beginning of a submarine base and related infrastructure at Visakhapatnam. *Kalvari*, a Soviet-built Foxtrot-class diesel-electric patrol submarine, displaced 2,475 tons when submerged and could carry 22 torpedoes or 44 mines. By 1970, the first four subs had arrived, and in 1971, a follow-on agreement was signed for four additional Russian ships of a similar design. India also acquired a submarine depot ship, INS *Amba*, to provide repairs while the dockyard at Visakhapatnam was being constructed.

The 1971 War demonstrated the value of India’s submarine fleet even as it made clear that “there is a vast difference between merely deploying submarines and conducting a campaign,” as India’s 2007 maritime strategy would later explain.⁷⁸ While India lost a frigate to a Pakistani submarine, the Indian fleet, including two of its submarines, was able to blockade the Karachi harbor and prevent the Pakistani fleet from

⁷⁷ Sourendra Nath Kohli, *We Dared: Maritime Operations in the 1971 Indo-Pak War* (New Delhi: Lancer International, 1989), quoted in G. M. Hiranandani, *Transition to Triumph: History of the Indian Navy, 1965–1975* (New Delhi: Lancer Publishers, 2000), 253, <http://indiannavy.nic.in/book/transition-triumph>.

⁷⁸ *Freedom to Use the Seas: India’s Maritime Military Strategy* (New Delhi: Integrated Headquarters Ministry of Defense, 2007), 19.

providing support in the Bay of Bengal. After the 1971 War, India built a second submarine base at Mumbai to save valuable transit time.

The next several decades saw India struggle to indigenize as many elements of its submarine program as possible, including refits and repairs and the production of submarine batteries. In 1981, India signed a contract for four SSKs with Howaldtswerke-Deutsche Werft (HDW), a German shipbuilding company. Two ships were to be built in Germany and two in Mumbai, thus beginning India's efforts to learn to build submarines. A further eight Kilo-class ships were acquired from Russia in the late 1980s.

By the early 1990s, India operated 20 conventional submarines and had begun its forays into the world of naval nuclear propulsion. In January 1988, India received its first nuclear submarine on lease from the Soviet Union, a Charlie-class SSN inducted into the Indian Navy as INS *Chakra*. Initially commissioned into the Soviet Navy in 1967, the aging *Chakra* was returned to the Soviet Union three years after delivery, in January 1991, and was decommissioned shortly thereafter. While in the Indian Navy's inventory, it was partially manned by Soviet sailors charged with training the Indians on the operation of a nuclear submarine. At present, India's only SSN is the newest iteration of INS *Chakra*, commissioned into the fleet in 2012.

B. THE DEVELOPMENT OF *ARIHANT*

In 1992, India began the construction of a shipbuilding center at Visakhapatnam at which it would develop the Advanced Technology Vehicle (ATV) that would later become INS *Arihant*. As noted earlier, *Arihant* has been touted as an indigenously designed and manufactured SSBN, though it bears an unsurprisingly strong resemblance to a Russian *Akula-II*. *Arihant* was first launched in 2009 for sea trials, and in August 2013, the reactor went critical, marking a milestone in India's development of advanced undersea capabilities. *Arihant* is powered by an 85-megawatt nuclear reactor and is expected to carry one of two possible SLBM loadouts: 12 K-15 or *Sagarika* missiles, each carrying a 1000 kg warhead with a range up to 700 km, or four K-4 missiles, each with a 2500 kg warhead and a maximum range of 3500 km.⁷⁹ Another two or three boats

⁷⁹ "PM launches INS Arihant in Visakhapatnam," *The Times of India*, July 26, 2009

of the same class are currently under construction; the eventual total class size is variously reported to be between three and six boats.⁸⁰

For all the self-congratulations that accompanied *Arihant*'s launch, it is unclear whether the Indian bureaucracy will be able to deliver and sustain the subsurface capabilities necessary for an operational sea-based deterrent, which will require a minimum of three SSBNs, along with the associated weapons, ship repair, and logistics infrastructure in order to keep at least one nuclear-armed boat at sea at all times.⁸¹ *Arihant* is already three years behind schedule. The two primary ballistic missile types are under development, though neither can yet be considered operational. *Sagarika* has undergone several successful rounds of testing from an underwater pontoon; the next major milestone will be a launch from *Arihant* herself. The other missile type, K-4, has only been fired from a submerged pontoon once; much more testing is necessary before it could be inducted into the fleet.

1. Bureaucratic Sclerosis and Acquisition Delays

If India's acquisition of conventional submarine technology is any indicator, it is likely that the introduction and operationalization of *Arihant* and her sister ships will face yet more delays. According to a 2014 statement by Defence Minister Manohar Parrikar, India "has yet to build a single submarine of the 24 it had planned starting in 1999."⁸² In 2005, after nine years of negotiations, India inked a \$3.1 billion deal with France to provide six *Scorpene*-class submarines, two of which are expected to be equipped with AIP technology that will allow them to go without snorkeling for up to 21 days.⁸³ The

80 Swami, "Arihant Propels India to Elite Club, but with a Headache"; "India Submarine Capabilities," *Nuclear Threat Initiative*, January 28, 2015, <http://www.nti.org/analysis/articles/india-submarine-capabilities/>.

81 This calculation is based on the U.S. Navy formula of needing at least three ships to keep one operational at all times, based on a cycle of dry dock maintenance, workup and training, and operational deployment.

82 Natalie Obiko Pearson and Anurag Kotoky, "Putin Ready to Lease Nuclear Submarines to India, Minister Says," *Bloomberg*, December 12, 2014, <http://www.bloomberg.com/news/2014-12-12/putin-ready-to-lease-nuclear-submarines-to-india-minister-says.html>.

83 Rajat Pandit, "Defence Minister Arun Jaitley Reviews Delayed Scorpene Submarine Project," *The Times of India*, August 28, 2014, <http://timesofindia.indiatimes.com/india/Defence-minister-Arun-Jaitley-reviews-delayed-Scorpene-submarine-project/articleshow/41039868.cms>.

“Project-75” *Scorpenes* are being built at Mazagon Docks in Mumbai under a technology transfer agreement with France. Construction on the first ship in the class began in 2006, with an expected delivery date of 2012; the rest were to be delivered by 2017.⁸⁴ The timetable has since been pushed back by four years because of “problems over technology transfers, lengthy price negotiations and overly complex negotiations on local co-production.”⁸⁵

While the French-designed SSPs will not provide the mobility and endurance of a nuclear submarine, they will “greatly reduce the ‘indiscretion rate’ of a traditional diesel-electric submarine, which must expose a snorkeling mast to recharge its batteries every few days at a minimum, and much more frequently if forced to operate at high speed.”⁸⁶ They would certainly be an improvement over the current diesel-electric fleet, of which eight of the 13 are over 25 years old and thus operating beyond their expected service life.⁸⁷ A 2014 analysis by the International Institute for Strategic Studies stated, “Of [the 13 SSKs], three are undergoing ‘medium refits’ (one has been in refit for nine years); and the *Sindhuratna* will be out of action for some time. This leaves only three or four submarines available for patrols at any given time.”⁸⁸

As argued earlier, the introduction of *Arihant* will create a greater demand for additional subsurface capabilities, if only to monitor adversaries’ attack submarines that may be tracking and collecting intelligence about the SSBNs. In addition to the *Scorpenes*, a tender for an additional six SSPs has been issued with an estimated price tag of \$8.1 billion. These “Project-75-India” ships will be constructed in India with foreign collaboration. While the project was granted “acceptance of necessity” in 2007, the first boat will not be delivered until at least 2025.⁸⁹ In February 2015, the Indian government announced that it would construct six indigenously-built SSNs. The cost is currently

⁸⁴ Ibid.

⁸⁵ “Challenges for India’s New Naval Chief,” *IISS Strategic Comments* 20, no. 16 (July 2014).

⁸⁶ Cote, Jr., *The Third Battle*, 80.

⁸⁷ “Challenges for India’s New Naval Chief.”

⁸⁸ Ibid.

⁸⁹ Pandit, “Defence Minister Arun Jaitley Reviews Delayed Scorpene Submarine Project.”

estimated at \$9.7 billion, but technical specifications have yet to be drafted.⁹⁰ Sources told *Times of India* that the government has “reworked” the 1999 submarine-building plan and is now aiming for six SSNs and 18 diesel-electric boats.⁹¹

Despite the articulated need for new submarines and the obsolescence of the current fleet, India’s acquisitions have been remarkably slow, pointing to a disconnect between rhetoric and reality that opens up questions about India’s commitment to fully developing its underwater arm. Several reasons have been offered for this inattention to the conventional submarine force: political indecision, bureaucratic inefficiencies, lack of financial resources, lack of shipyard infrastructure, and project mismanagement are only a few.⁹² This bureaucratic inertia may also hamper India’s ability to fully incorporate its subs into its strategic plans, raising further questions about the credibility and reliability of a so-called “assured” second strike. Regarding the acquisition of conventional capabilities, Walter Ladwig argues that “the lethargic pace with which the [Ministry of Defence] has pursued new submarines demonstrates the relative lack of interest in the submarine fleet.”⁹³ While this lack of interest may benefit crisis stability through an absence of additional conventional assets, it could also create problems if adversaries impute the problems the conventional program faces to the strategic program. If adversaries believe India is not able or willing to maintain a safe and secure fleet of SSBNs, they may be emboldened in crises to believe they could attrite what few systems exist at that moment. This would create clear use-or-lose pressures for India.

90 Rajat Pandit, “Govt Approves Construction of 7 Stealth Frigates, 6 Nuclear-Powered Submarines,” *The Times of India*, February 18, 2015, <http://timesofindia.indiatimes.com/india/Govt-approves-construction-of-7-stealth-frigates-6-nuclear-powered-submarines/articleshow/46281364.cms>.

91 Ibid.

92 “Challenges for India’s New Naval Chief”; Dinakar Peri, “Year of Mixed Fortunes for Navy,” *The Hindu*, January 1, 2015, <http://www.thehindu.com/news/national/year-of-mixed-fortunes-for-navy/article6743093.ece>; Swami, “Arihant Propels India to Elite Club, but with a Headache”; “India Submarine Capabilities.”

93 Walter C. Ladwig III, “Drivers of Indian Naval Expansion,” in *The Rise of the Indian Navy: Internal Vulnerabilities, External Challenges*, ed. Harsh V. Pant (Surrey, UK: Ashgate, 2012), 29.

2. Accidents, Incidents, and Safety

As the Cold War experience shows, the development of a credible deterrent must go beyond simply constructing missiles and delivery systems. India must also cultivate a bureaucratic infrastructure dedicated to honestly and rapidly correcting mistakes throughout the institution, as the United States did in the wake of the *Thresher* accident. This is especially crucial for a fleet as small as India's is projected to be. Given India's historic linkages to the Russian submarine force and ship design, particularly with regards to naval nuclear propulsion, and given Russia's checkered history of accidents as a result of design flaws and low-quality materials and workmanship, India will need to be extra vigilant about safety as it broadens its introduction of nuclear power and weapons to its fleet. If India and its adversaries believe its second strike rests on the SSBN fleet, the loss of a single boat could jeopardize the credibility of India's second strike. While unlikely, an adversary considering a first strike could avail itself of the opportunity presented by the incapacitation of the deployed boat to target those remaining in port in a first strike.

INS *Chakra*, India's only SSN, highlights the necessity of thoroughgoing organizational change that embraces a rigorous approach to safety and maintenance. *Chakra* is the former Russian SSN *Nerpa*, an *Akula* II-class boat, quiet and advanced. Russia, which never adopted a safety-first approach to submarine construction, has a long track record of serious mechanical problems with its submarines. The construction of *Nerpa* began in 1993, but was delayed for a decade as a result of funding difficulties in Russia. In 2004, India signed an agreement to subsidize construction, and after a series of delays, *Nerpa* was launched for sea trials in October 2008. A month later, *Nerpa*'s fire suppressant system was accidentally triggered, causing the deaths of 20 Russian sailors and injuring dozens more. Repairs to *Nerpa* took another year, and the boat was not delivered to India until October 2011. While Russia has been able to offset technical weakness with sheer quantity, India will need to be more attentive to the need for bureaucratic change and a robust safety program.

The likelihood of accidents is of course difficult to determine, but India's safety and maintenance record with its conventional submarines is less than stellar, suggesting

the Navy bureaucracy may not be up to the task of stewarding a new class of boats. Delayed maintenance and service life extensions have taken their toll on the small fleet of aging diesel submarines currently in the Indian Navy. Even regular maintenance is no guarantee of safety. In August 2013, having recently returned from a \$133 million refit in Russia, an explosion aboard INS *Sindhurakshak* while in port took the lives of all 18 sailors aboard.⁹⁴ This followed a 2010 incident on the same boat involving a faulty battery valve that caused an explosion that killed one sailor and injured two others. In February 2014, a fire aboard INS *Sindhuratna* killed two and injured seven. The following month, one civilian was killed and two injured when a hatch blew off during a hydro-pressure test on INS *Aridhaman*, the second ship in the *Arihant* class. According to a report by *The Times of India*, “the accident comes at a time when the ‘hull and full form’ of INS *Aridhaman*... is ready for ‘launch’ into water.” An unnamed officer quoted in that article suggested that had the accident occurred inside the submarine, it would have been “catastrophic.”⁹⁵

These high-profile accidents led to the resignation of Chief of Naval Staff Admiral D.K. Joshi, who took “moral responsibility” for the string of incidents.⁹⁶ Several months later *The Hindu* reported that Joshi blamed “a ‘dysfunctional and inefficient business model’ in which the service has professional competence, accountability and responsibility but no financial empowerment.”⁹⁷ He was replaced two months later by Admiral Rabinder (Robin) Kumar Dhowan, who will face myriad challenges in his efforts to improve operational readiness, including procurement delays, training and safety shortfalls, and troubled civil-military relations. As former Navy Chief Admiral Arun Prakash said, “All in all, 2014 was a year of mixed fortunes for the Navy. With the induction of *Vikramaditya* and sea trials of *Arihant* the service has crossed significant

94 “Indian Sailors Killed in Submarine Explosion, Sinking, Official Says,” *FoxNews.com*, August 14, 2013, <http://www.foxnews.com/world/2013/08/14/indian-naval-submarine-sinks-catches-fire/>; Pearson and Kotoky, “Putin Ready to Lease Nuclear Submarines to India, Minister Says.”

95 Rajat Pandit, “Post-Accident, Lens on Nuclear Submarine Projects,” *The Times of India*, March 10, 2014, <http://timesofindia.indiatimes.com/india/Post-accident-lens-on-nuclear-submarine-projects/articleshow/31758017.cms>.

96 “Challenges for India’s New Naval Chief.”

97 Peri, “Year of Mixed Fortunes for Navy.”

milestones. But with two serious accidents and the resignation of a chief, the Navy needs to undertake introspection and draw some lessons, which I am sure is being done.”⁹⁸

The lessons the Navy must draw include the need for organizational and cultural changes in order to field a credible and assured second-strike capability. The effective employment of a submarine force involves highly specialized, highly technical knowledge for which the organizational learning curve is steep.⁹⁹ Absent cultural and bureaucratic changes to increase the reliability of the delivery system, a small fleet of SSBNs may invite an adversary to believe that the second strike is not credible and that attrition is possible in the event of a crisis. This is not to suggest that India will not eventually be able to field its planned fleet of SSBNs, but there is reason to believe it will be much slower and the deterrent less secure and assured than initially hoped.

C. INDIA’S NUCLEAR DOCTRINE AND PURSUIT OF A TRIAD

Despite the internal challenges associated with the introduction of the *Arihant* class, the logic behind India’s pursuit of an SSBN is broadly similar to that of the United States during the Cold War. Bernard Brodie’s point regarding the cost-benefit analysis associated with the pursuit of a submarine-based deterrent is relevant in South Asia as well; though the costs may be high relative to land-based assets, there is an irreplaceable value associated with a credible, secure, and assured second strike when facing nuclear-armed adversaries. Writing in 2001, Ashley Tellis argued that the Indian government would pursue a sea-based nuclear deterrent “simply as a hedge against strategic uncertainty.”¹⁰⁰ He further suggested that only if the strategic environment “[imposes] burdens of the sort that cannot be neutralized through land-based solutions” would the Indian government actually deploy nuclear weapons at sea.¹⁰¹ If this is so, it would appear that India has definitively concluded that land-based missiles are insufficient to

⁹⁸ Ibid.

⁹⁹ See Michael Horowitz, *The Diffusion of Military Power* (Princeton, NJ: Princeton University Press, 2010) on the importance of both the financial resources to purchase a technology and the organizational capacity to make institutional changes to support the new technology.

¹⁰⁰ Tellis, *India’s Emerging Nuclear Posture*, 529.

¹⁰¹ Ibid.

meet the threat India believes itself to face, and that it therefore requires a deployable nuclear triad.

India publicly raised the idea of a nuclear triad in 1998. According to C. Raja Mohan, India's 1999 draft nuclear doctrine indicated two potentially contradictory principles: "One was that India would limit itself to a credible minimum deterrent and had no wish to embark on an arms race with any other country. At the same time, the doctrine declared that India will develop the classical 'triad' of delivery systems."¹⁰² Rear Admiral Raja Menon, perhaps India's foremost expert on India's submarine force and its nuclear aspirations, has argued that "eventually nuclear subs earn their keep every day of the year. Ballistic missile submarines save nations on that one fateful day, when the enemy's political leaders look at our SLBMs and stay their hand on the button." He further suggests that only SSBNs offer an "unshakeable second strike" that increases the credibility of a No First Use doctrine.¹⁰³ While India's land-based nuclear arsenal may be large enough to withstand a counterforce strike and still retaliate with sufficient power to destroy its attacker, submarines in theory are hard to find and are always on the move, making them elusive targets. They would thus be secure from a decapitation attempt and would assure India's ability to massively retaliate, at least in theory.

As *Arihant* nears operational status, it is worth examining how India sees the third leg of the nuclear triad fitting into its overall nuclear strategy. A substantial literature on India's nuclear strategy and doctrines has developed over the last several decades, primarily focused on its land-based force posture. Historically, India's nuclear posture has rested on three precepts: the policy of no first use (NFU) of nuclear weapons; the goal of credible minimum deterrence; and the principle of robust civilian control of the

¹⁰² C. Raja Mohan, *Samudra Manthan: Sino-Indian Rivalry in the Indo-Pacific* (Washington, DC: Carnegie Endowment for International Peace, 2012), 71.

¹⁰³ Raja Menon, "Just One Shark In The Deep Blue Ocean," *Outlook*, August 10, 2009, <http://www.outlookindia.com/article/Just-One-Shark-In-The-Deep-Blue-Ocean/261048>.

nuclear arsenal, in part through the maintenance of weapons in a disassembled state.¹⁰⁴ Indeed, as India's 2007 maritime strategy document states:

Our 'No First Use' policy amply illustrates India's intentions of using the nuclear deterrent only as a retaliatory measure of last resort. The sea-based leg of the nuclear triad enables a survivable second-strike capability and is, therefore, a critical enabler for the nuclear doctrine of 'No First Use' to attain credibility. ... The nuclear submarine option is the preferred arsenal for small nuclear forces.¹⁰⁵

The introduction of a sea-based deterrent accords well with India's NFU policy, with two stipulations. First, the SSBN delivery system must be credible and safe in order to provide the assured second strike. Second, in order to avoid undermining the NFU pledge, the SLBMs on board must be imprecise enough that they are appropriate only for a countervalue strike and not for a counterforce strike. If they can be used for a counterforce attack, adversaries are likely to invest in additional ASW assets to keep India's SSBNs out of striking range—generating additional upward pressure on ASW and strategic arsenals.

While perhaps not at odds with its No First Use doctrine, an Indian SSBN does open up questions about potential changes to India's command and control procedures and preferences. Indian civilian leaders have been loath to give control of assembled nuclear weapons to the Indian armed forces, leading to the (perhaps now erroneous) belief that India's nuclear weapons are maintained in a "disassembled and dispersed configuration."¹⁰⁶ For the land-based weapons, the Defence Research and Development Organisation (DRDO) maintains the nuclear warheads, while the delivery systems belong to the armed forces. This is obviously an extremely unlikely configuration for an SLBM

104 Vipin Narang, "Five Myths about India's Nuclear Posture," *The Washington Quarterly* 36, no. 3 (2013): 143. For more on India's nuclear doctrine and posture, see George Perkovich, *India's Nuclear Bomb: The Impact on Global Proliferation* (Berkeley, CA: University of California Press, 1999); Raja Menon, *A Nuclear Strategy for India* (New Delhi: Sage Publications, 2000); Ashley J. Tellis, *India's Emerging Nuclear Posture: Between Recessed Deterrent and Ready Arsenal* (Santa Monica, CA: RAND Corporation, 2001); Sagan, *Inside Nuclear South Asia*; Vipin Narang, *Nuclear Strategy in the Modern Era: Regional Powers and International Conflict*, Princeton Studies in International History and Politics (Princeton, NJ: Princeton University Press, 2014).

105 *Freedom to Use the Seas: India's Maritime Military Strategy*, 11.

106 Vipin Narang, "Five Myths about India's Nuclear Posture," *The Washington Quarterly*, vol. 36, no. 3 (Summer 2013), 149.

on a deterrent patrol, and may reflect a shift in Indian attitudes toward assertive civilian control. Such a shift would be particularly troubling for Pakistan, which has come to expect that the Indian civilian government will keep the Indian military in check during crises. The Indian government has given no clear indication how it intends to reconcile the question of civilian control over nuclear assets at sea.

Two related command and control issues are the “always-never dilemma” and the problem of maintaining communications with deployed submarines. The “always-never dilemma” refers to the challenge of ensuring that nuclear weapons are always ready for use but can never be launched accidentally or without the proper authorization. In the context of ballistic missile submarines, the problem of unauthorized launch becomes a technological question as much as a personnel surety issue. For submarines, constant communication is undesirable, as message traffic could be used to locate the boat. In the event of a crisis, the destruction of C2 nodes such as VLF stations could mean any SSBNs on patrol would be unable to receive instructions. In the event of connectivity failure, the question of predelegation arises: if the political leadership cannot be reached, how should the forces respond? Who, if anybody, has launch authority?¹⁰⁷

As Feroz Khan argues, “The propensity of South Asia to run into crisis makes the case for establishing a reliable command and control system all the more crucial.” He continues by noting that “the vulnerability of the central command to a decapitating attack forces it to pre-delegate not the *authority* to launch nuclear weapons, but the *ability* to do so. While bolstering the deterrent threat, the diffusion of the ability to initiate nuclear use multiplies the difficulty of preventing three dangers: accidents, tampering, and un-authorized use.”¹⁰⁸ Different countries have attempted to resolve the problem of ensuring political control over their SSBNs without limiting the weapon system’s usability in different ways. The U.S. originally opted for a two-man rule, then moved to PALs, while British political leaders gave their submarine commanders “beyond the

107 Clayton Bowen and Daniel Wolven, “Command and Control Challenges in South Asia,” *The Nonproliferation Review* 6, no. 3 (Spring-Summer 1999): 28.

108 Feroz Hassan Khan, “Pakistan’s Nuclear Future,” in *South Asia in 2020: Future Strategic Balances and Alliances*, ed. Michael R. Chambers (Carlisle, PA: Strategic Studies Institute, U.S. Army War College, 2002), 166.

grave” pre-planned directives in the event that the United Kingdom was destroyed.¹⁰⁹ It is not yet clear how India will resolve this particular challenge. While there are obvious operational security issues associated with disclosing information about an SSBN program, a public discussion of how Indian political leadership intends to resolve the always-never dilemma and the problem of maintaining assertive control might lend credence to India’s claim that its SSBN is a viable, considered approach to bolstering its minimum credible deterrent posture. Pakistan in particular has relied on India’s civilian leadership to keep the Indian military in check during previous crises. If Pakistan comes to believe that Indian SSBNs are not under robust civilian control, it may be more inclined toward worst-case thinking and react accordingly. As Raja Menon notes, “In deterrence, only perceptions matter and there is a disturbing build-up of literature indicating that the disbelief of others in our nuclear command and control is in urgent need of correction.”¹¹⁰

109 W.P.S. Sidhu, “Whose Finger on the Nuclear Trigger at Sea?,” *Livemint.com*, August 4, 2013, <http://www.livemint.com/Opinion/FesGy5sItj3WTJywQdfiKO/Whose-finger-on-the-nuclear-trigger-at-sea.html>.

110 Raja Menon, “A Mismatch of Nuclear Doctrines,” *The Hindu*, January 22, 2014, <http://www.thehindu.com/opinion/op-ed/a-mismatch-of-nuclear-doctrines/article5602609.ece>.

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V. ARIHANT: DETERRING WAR OR COURTING DISASTER?

The internal challenges India is facing in building, acquiring, and fielding new submarines, including the *Arihant*-class ships, have repercussions for its relations with its regional rivals. In this chapter, I will unpack the potential effects the Indian SSBN may have on China and on Pakistan, with an emphasis on arms race stability and crisis stability. While it is unlikely that *Arihant* will induce major changes in China's naval or nuclear policies, it is also unlikely to achieve any of India's strategic aims vis-à-vis China. With regards to Pakistan, however, *Arihant* and her sisters may generate a new vector for crisis instability. Furthermore, India's SSBN acquisition increases the pressure Pakistan feels to acquire its own triad while driving Pakistan's need for additional conventional naval capabilities.

A. INDIA-CHINA DYAD

India's initial decision to acquire nuclear weapons was driven in large part by its relations with China.¹¹¹ After the disastrous 1962 Sino-Indian war over an unresolved border, India had a black eye and a deep-seated fear of China that drove its turn toward realpolitik—and toward nuclear weapons. The Chinese nuclear test at Lop Nor in 1964 provided further impetus for India's nuclear weapons program. Since then, concern about Chinese intentions and capabilities have undergirded Indian strategic thinking. The Sino-Indian border issues in Arunachal Pradesh and Aksai Chin have not yet been resolved, which leaves India uneasy and gives China the upper hand in bilateral negotiations, as it knows India would strongly prefer a compromise to a confrontation.¹¹² As China continues to grow economically and militarily, India finds itself in the uncomfortable position of trying to ward off Chinese aggression while not provoking China into an arms race. This balancing act is complicated by India's close trade relationship with China: China is India's top trading partner. These trade ties could be a potential source of stability and cooperation in the future; economic integration often creates incentives for

¹¹¹ Menon, *A Nuclear Strategy for India*, 75.

¹¹² Pravin Sawhney, *The Defence Makeover: 10 Myths That Shape India's Image* (New Delhi: Sage Publications, 2002), 53.

greater cooperation through raising the opportunity cost of conflict. However, while there is a historical correlation between increased regional trade and improved regional security, there are numerous cases in which tightly integrated economies have gone to war with one another, such as Europe during World War I.¹¹³ Trade balances are not a guarantee of future interdependence or the cross-border cooperation that might lead to increased stability.

There is also no guarantee that this process will not reverse itself; while China and India have good reasons to maintain their trade relationships now, they may find themselves in competition for the resources necessary for economic growth, particularly energy. Both countries require economic growth to improve their populations' low standards of living, which will be necessary, particularly for India, to prevent intrastate conflict from spreading. In addition to the demand for energy to run the businesses and factories that drive economic development, there is growing consumer demand for electricity and oil. According to Ladwig, India's current oil consumption is expected to double by 2025, most of which must be imported. This demand bubble is growing even as global oil resources become scarcer and more expensive. This competition over resources could lead to a more adversarial relationship and more aggressive postures as India expands its "legitimate areas of interest" to include the arc from the Straits of Malacca to the Persian Gulf.¹¹⁴

It is in the context of resource access and regional influence that China has been a significant factor in India's naval acquisition and modernization efforts. As China's maritime ambitions have grown and its navy has expanded, India has become increasingly concerned about what it perceives as a serious and growing threat to India's interests throughout the IOR. A partially declassified Indian government report from

113 See Norman Angell, *The Great Illusion: A Study of the Relation of Military Power to National Advantage*, Fourth Revised and Enlarged Edition (New York: G.P. Putnam's Sons, 1913), accessible at <http://www.gutenberg.org/files/38535/38535-h/38535-h.htm>, for earliest iterations of economic interdependence theory. Critiques of economic interdependence theory may be found in *inter alia* John J. Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton & Co, 2001); Kenneth N. Waltz, *Theory of International Politics* (Long Grove, IL: Waveland Press, 2010).

114 Walter C. Ladwig, III, "India and Military Power Projection: Will the Land of Gandhi Become a Conventional Great Power?," *Asian Survey* 50, no. 6 (December 2010): 1170.

2001 noted “India’s ‘vital interest in the security and stability of the Sea Lanes of Communication in the Indian Ocean’ because of energy and trade flows” and in 2004, “the navy formally enunciated its area of interest as stretching from the Persian Gulf to the Malacca Strait. With over half of India’s trade passing through the strait, and China’s People’s Liberation Army Navy achieving greater reach into the Indian Ocean, the strategic focus of the Indian navy was extended to a ‘secondary’ maritime area including the South China Sea.”¹¹⁵ In 2009, former Chief of the Indian Navy Admiral Arun Prakash declared, “It is time for India to shed her blinkers and prepare to counter PLA Navy’s impending power-play in the Indian Ocean.”¹¹⁶

China’s increasing engagement with IOR states has India drawing redlines “vis-à-vis Chinese activities in the Indian Ocean,” according to James Holmes and Toshi Yoshihara, “with the goal of deterring Beijing from actions that infringe unacceptably on Indian interests as India interprets them.”¹¹⁷ Among these redlines, Holmes and Yoshihara identify three potential naval triggers of Sino-Indian hostilities: forward deployment of Chinese nuclear submarines to the Indian Ocean; the development of a network of Chinese naval facilities across the IOR; or a Chinese effort to keep India out of the South China Sea. While it seems unlikely that any of these developments would lead directly to war absent other drivers, there is a great deal of consternation among Indian navalists about the threats posed by Chinese submarines. In 2013, for example, an Indian defense ministry report indicated that China had been sending attack submarines into the Indian Ocean with an “‘implicit focus’ [on] undermining the Indian Navy’s [ability] ‘to control highly-sensitive sea lines of communication.’”¹¹⁸ The concern about China’s intentions percolates into Indian thought about Pakistan as well; in an article contextualizing India’s growing maritime power, Arun Prakash notes that “we need to

115 “Challenges for India’s New Naval Chief.”

116 Thomas Mathew, “Mighty Dragon in the Sea,” *Hindustan Times*, June 23, 2009, <http://www.hindustantimes.com/comment/columnsothers/mighty-dragon-in-the-sea/article1-424622.aspx>.

117 James R. Holmes and Toshi Yoshihara, “Redlines for Sino-Indian Naval Rivalry,” in *Deep Currents and Rising Tides: The Indian Ocean and International Security*, ed. John Garofano and Andrea J. Dew (Washington, DC: Georgetown University Press, 2013), 185.

118 J. Michael Cole, “Red Star Over the Indian Ocean?,” *The Diplomat*, April 9, 2013, <http://thediplomat.com/2013/04/red-star-over-the-indian-ocean/>.

remember that Pakistan... is also a critical tool in China's Machiavellian strategy to checkmate India's inchoate ambitions of regional leadership."¹¹⁹

Indian officials and scholars have indicated that India's pursuit of a sea-based deterrent is intended to deter China, but they have been less clear about precisely which Chinese actions or ambitions India's SSBN could potentially deter. There is a disconcerting lack of conceptual clarity among Indian statements about the linkages—or lack thereof—between increased Chinese naval activity in the IOR and the functions an Indian SSBN could perform. There is no causal mechanism by which an operational SSBN fleet could prevent China's naval expansion into the IOR along the lines Holmes and Yoshihara provide; it is simply not credible to expect India conduct a first strike, thereby abandoning its NFU doctrine and inviting Chinese retaliation, simply because China forward deployed a few submarines in the IOR. Nor can *Arihant* deter Chinese conventional adventurism on land; the fate of Arunachal Pradesh does not rest on *Arihant*'s shoulders, though a secure second strike could provide India space for more assertive negotiation.

What of deterring nuclear annihilation? While India may worry in the abstract about a Chinese first strike, there are few plausible scenarios in which China is likely to see itself as deriving benefits from a massive counterforce first strike against India. Even granting such a possibility, an Indian SSBN provides only a marginal additional deterrent value against China, particularly as it is currently configured. Unless and until the K-4 is ready, any Indian attempt to use its new ballistic missile submarine capability in a second-strike role against China would require a transit to the South China Sea, or even the East China and Yellow Seas, to hold Chinese countervalue targets at risk. This would put the Indian SSBN within range of Chinese surface and air ASW capabilities, against which *Arihant* would have no defenses—hardly an assured second strike. Even with the K-4, the one or two SSBNs not in port during a Chinese first strike would be left to retaliate with a maximum of four to eight ballistic missiles. Whether China would risk

119 Arun Prakash, "India's Growing Maritime Power: Roots, Objectives and Long-Term Plans," in *Twenty-First Century Seapower: Cooperation and Conflict at Sea*, ed. Peter Dutton, Robert S. Ross, and Øystein Tunsjø (London: Routledge, 2012), 96.

Indian retaliation may depend on the future configuration of the K-4 missiles, how reliable China considers them to be, and how confident China is in its ASW abilities beyond the South China Sea.

On the positive side, an Indian SSBN fleet is unlikely to change China's nuclear force posture. As noted, estimates vary, but the total figure for the *Arihant*-class fleet is thought to be in the range of 5–6 boats, which is hardly enough to induce a rethink of Chinese strategy and force posture. As Andrew Winner notes, "China has lived with the vastly more substantial submarine presence embodied by the U.S. Navy for many years. It will understandably regard the seagoing Indian deterrent as a lesser included case for peacetime strategy."¹²⁰ While China may not view India's SSBN as an immediate threat that requires significant force structure changes, China is likely to increase its surveillance efforts in the IOR so as to collect data about Indian SSBN operational patterns and acoustic signatures, with submarines being an obvious choice of ISR platform—exactly the sort of behavior India hopes to quash.

Indeed, it is in the conventional realm that the possibility for arms race and crisis instability rears its head, particularly if China develops its ASW abilities and increases patrols in the areas in which India's SSBNs are likely to operate. As China improves its ASW capabilities and its ability to monitor the IOR from the various naval bases and ports it has helped build, India's patrolling SSBN will become less secure. This is likely to take several years, but if China's ASW abilities outpace India's shipbuilding and quieting abilities, the trend line points toward a less secure system. While the U.S. was able to detect Russian subs, as explained earlier, Russia's large quantity of boats provided a measure of security; the U.S. could never be entirely sure it could find all of them. China, however, will only have to find one or two submarines, which will have distinctive acoustic signatures that identify them as the Indian SSBNs. Indian attack submarines are likely to be tasked with counter-ASW against these Chinese ISR efforts. Without a framework for negotiating accidents and incidents at sea, any encounters

120 Winner, "The Future of India's Undersea Nuclear Deterrent," 173.

between the two forces are left to chance. As the number of conventional systems grows, the likelihood of accidental encounters grows apace.

B. INDIA-PAKISTAN DYAD

The most serious source of instability between India and Pakistan is nonstate actors, specifically those who have received support from Pakistan. Pakistan's reliance on non-state actors is not a new phenomenon, nor is it an astrategic choice; as Kapur and Ganguly argue, "[Supporting] jihad has been one of the principal means by which the Pakistani state has sought to produce security for itself. Far from an unmitigated disaster, the strategy has enjoyed important domestic and international successes."¹²¹ Stretching back to the first Kashmir war in 1947, Pakistan's use of nonstate actors has stemmed from its material weakness vis-à-vis India; as a conventionally weak state with a comparatively strong state next door, Pakistan had to develop a strategy that would allow it to attrite Indian resources without spending a lot of money and while maintaining plausible deniability to prevent full-scale retaliation.

Over the following decades, Pakistan's use of militants became a centerpiece of its strategic thought, particularly after the 1971 Bangladesh War made India's overwhelming conventional superiority apparent, especially as Pakistan had eschewed the use of militants during that conflict. While it took Pakistan some time to settle on which militant groups it would back, it eventually chose to partner with organizations, such as Lashkar-e-Taiba and Jaish-e-Mohammed, that "promoted Islamist sociopolitical agendas and sought Kashmir's accession to Pakistan,"¹²² and were willing to use extreme violence to achieve their goals. Pakistan provided "extensive financial, logistical, and military support"¹²³ to these groups in an effort to weaken India and keep Kashmir on the international agenda. Over the last decade, these groups have carried out significant terrorist attacks, both in Kashmir and in the Indian homeland, and while Pakistan has

¹²¹ S. Paul Kapur and Sumit Ganguly, "The Jihad Paradox: Pakistan and Islamist Militancy in South Asia," *International Security* 37, no. 1 (July 2012): 113–114.

¹²² Ibid., 127.

¹²³ Ibid., 128.

promised to crack down on them, LeT and others continue to operate relatively freely within Pakistan.

Pakistan now faces a classic principal-agent problem with the groups that it has funded and supported; while their interests may have aligned for a time, the militant groups have grown too powerful to be fully controlled by the principal, and are now in a position to pursue their own policies and agendas, which diverge from Pakistan's. As Kapur and Ganguly note, these "nonstate actors ... have taken on a life of their own. They now behave in ways that are not only damaging to India but also detrimental to Pakistan's national interests."¹²⁴ Pakistan has belatedly discovered that these militant groups are pursuing more ambitious goals that do not align with Pakistani strategic interests. When Pakistan has attempted to retract support for these groups, however, its leaders have become targets for assassinations and its security installations have been attacked. More generally, the resources that have gone to support and then combat insurgent groups has created opportunity costs for a state that has long struggled with material weakness and low development rates. There are also indirect costs to this strategy; as Kapur and Ganguly argue, "Pakistan's asymmetric warfare campaign, by continually provoking India, helps to create an extremely hostile and demanding strategic environment on the subcontinent. It is this environment, in turn, that forces Pakistan to devote such a high level of resources to ensuring its external security."¹²⁵

As intended, Pakistan's use of nonstate actors has hurt India and left it struggling to find appropriate ways to respond. Following the December 2001 terrorist attack on the Indian parliament, the Indian army laboriously mobilized to the border with Pakistan only to end up turning around and going home when it became clear that India had lost the advantage of surprise and was instead succeeding in resolving the crisis through diplomatic and political channels. Recognizing the need for a military option that would not cross Pakistan's nuclear threshold but would allow India to punish Pakistan for destabilizing behavior, including the continued support of terrorist groups, India began to develop the Cold Start doctrine. In theory, Cold Start would allow India to make a rapid

¹²⁴ Ganguly and Kapur, *India, Pakistan, and the Bomb*, 84.

¹²⁵ Kapur and Ganguly, "The Jihad Paradox," 136–137.

but shallow assault into Pakistan and hold territory there without triggering a nuclear response from Pakistan. To counter Cold Start, Pakistan has pursued tactical nuclear weapons, with the intent of making any border crossing a step up the escalation ladder toward nuclear use.¹²⁶

The future of the South Asian militant groups is an open question, as neither India nor Pakistan has the capacity to eliminate the threat they pose. The 2008 Mumbai attacks demonstrated that despite the rhetoric, Pakistan has been unable to rein in these groups. On India's part, a major Indian city was held hostage for three days by a handful of gunmen, suggesting that India's security services are not up to the task of quelling the threat. Militant groups are the most likely proximate cause of instability in the region; while India may not care to retake by force the part of Kashmir it lost in 1947, another incident like the 2001 assault on parliament or an uptick in major terrorist attacks in the Indian homeland could cause the Indian government to respond aggressively. Within the India-Pakistan dyad, an assured second strike is not going to prevent conflict from breaking out or escalating conventionally. There is no obvious role for SSBNs to enhance deterrence at the subconventional or non-state actor level.

As discussed, within traditional formulations of nuclear deterrence theory, dyadic pairs achieve strategic stability when both sides have an assured second-strike capability. This second-strike capability mitigates the arms race dynamic in which states demand superior numbers of nuclear weapons so as to minimize the chance of losing them all in a first strike. In the Indo-Pakistan context, however, nuclear arms racing has less to do with fears of a nuclear first strike and more to do with Indian and Pakistani fears of, respectively, subconventional and conventional attacks that could escalate to a nuclear exchange. Neither side can feel entirely confident that it can respond to provocative behavior without potentially stumbling into a nuclear red zone. Within this dynamic, an Indian SSBN cannot contribute to deterrence against Pakistan in any meaningful way.

126 See *inter alia* Ganguly and Kapur, *India, Pakistan, and the Bomb*; Feroz Hassan Khan, *Eating Grass: The Making of the Pakistani Bomb* (Stanford, CA: Stanford University Press, 2012); Joshi, "Pakistan's Tactical Nuclear Nightmare"; Smith, "The U.S. Experience with Tactical Nuclear Weapons: Lessons for South Asia"; Narang, *Nuclear Strategy in the Modern Era*; McCausland, "Pakistan's Tactical Nuclear Weapons: Operational Myths and Realities."

India's nuclear arsenal already has massive retaliation and second strike covered without *Arihant*, and it hasn't solved the problem of Pakistani support for militants.

An Indian SSBN may in fact be a new source of instability in South Asia. *Arihant* has generated arms race pressures vis-à-vis Pakistan, however much Indian strategists would like to deny it. Admiral Menon has argued that Pakistan's concerns about the SSBN "reflect their own India-specific preoccupations and threat analysis." He has blamed the "incipient arms race" on Pakistan and the "illegal" assistance it receives from China.¹²⁷ For Pakistan, however, an Indian SSBN may provide additional upward pressure on Pakistan's arsenal. As Andrew Winner explains, "The two ideal stabilizing characteristics of any weapon system are its invulnerability to enemy attack and its being nonthreatening to an enemy's nuclear forces—presumably including the command-and-control structures governing those forces."¹²⁸ Pakistan must now account for this additional threat in determining its preferred nuclear force structure.

It should hardly come as a surprise to India that its sea-based deterrent would spur Pakistan to pursue its own triad. Pakistan's perceived need to keep up with India militarily has long been a fundamental element in Pakistani decision-making. The most commonly discussed formulation of a Pakistani sea-based deterrent is a diesel-electric *Agosta* 90B equipped with air-independent propulsion and nuclear-tipped *Babur* cruise missiles. Should Pakistan acquire a triad in pursuit of parity with India, it is possible Pakistan could feel more secure about the survivability of its deterrent and thus less likely to arms race. Given Pakistan's conventional weakness and its adoption of an asymmetric escalation strategy that relies on the threat of first use, however, it is more likely that Pakistan would simply add sea-based weapons to its arsenal while continuing its pursuit of new delivery systems and more warheads in its elusive pursuit of what it terms full-spectrum deterrence.¹²⁹ Sea-based weapons do not resolve the credibility problem surrounding Pakistan's threat of early first use of nuclear weapons against Indian cross-

127 Raja Menon, "We're Not Racing Anywhere, Pakistan," *The Indian Express*, August 19, 2009, <http://indianexpress.com/article/opinion/columns/were-not-racing-anywhere-pakistan/>.

128 Winner, "The Future of India's Undersea Nuclear Deterrent," 169.

129 See Narang, *Nuclear Strategy in the Modern Era*, particularly chapters 1–3, for an in-depth discussion of Pakistan's nuclear force posture.

border operations. Furthermore, the deployment of Pakistani nuclear warheads aboard an *Agosta* submarine introduces the specter of inadvertent escalation. In a crisis, Indian ASW would not be able to tell conventionally-armed *Agosta* 90Bs from those carrying nuclear warheads, and could unintentionally strike a nuclear-armed boat. Given the history of mistrust, Pakistan may believe such an incident to be an intentional effort to degrade Pakistan's second-strike capabilities. On the conventional arms race front, Pakistan has also indicated its interest in better ASW, both via new attack submarines and additional air assets. Since 2011, Pakistan has been in negotiations with China over the purchase of six AIP-equipped *Yuan*-class submarines.¹³⁰

Pakistan is also pursuing naval nuclearization in an effort to keep pace with India, though it is several years away from solving the technical challenges inherent in miniaturizing a nuclear reactor and putting it on a boat. Here too is evidence of the desire for a capability outstripping the conceptual or operational requirement for that capability. For Pakistan, the northwest corner of the Indian Ocean presents the geographic limits of its maritime interests. Given the relatively smaller area in which their submarines operate, there is less of a technical requirement for nuclear propulsion. Moreover, the introduction of naval nuclear propulsion in Pakistan creates new dangers for theft of fissile material by militant groups and new demands for personnel reliability programs. While India ought not bear the blame for Pakistan's nuclear surety problems, Pakistan's pursuit of naval nuclear propulsion in an effort to keep pace with India could have deleterious effects on Indian security in the long run.

130 Dasgupta, "Pak Set to Get Chinese Submarines amid Sub Crisis in India."

VI. CONCLUSION: DETERRING WAR WHILE COURTING DISASTER

Contrary to conventional wisdom, nuclear-armed submarines are not *ceteris paribus* stabilizing elements. A close examination of the empirics of the Cold War reveal important dynamics that have been overlooked in the standard formulations of nuclear strategy. While the Brodies once argued that, “what was once regarded as a backstop to the land-based force of ICBMS seems likely, as the latter appear less secure, to become the main deterrent force,”¹³¹ there is little evidence to suggest that the acquisition of sea-based deterrents precludes states’ ongoing pursuit of land-based or air-delivered nuclear weapons. Furthermore, as illustrated by the *Thresher* accident, nuclear-powered submarines introduce internal challenges for navies attempting to transition away from diesel even as they make safety and maintenance more critical than ever. As the nuclear asset most likely come into contact with neutral or hostile forces during standard peacetime activities, SSBNs create the potential for crisis escalation as the result of accidents or incidents at sea. SSBNs also raise the specter of a no-warning first strike as well as present a target for naval doctrines that see SSNs engaged in a counterforce strategy. There were real costs and trade-offs to the adoption of ballistic missile submarines during the Cold War, both in the form of escalation potential and in material and resources expended on the SSBN fleets as well as the research and development, acquisition, manning, and maintenance of robust air and naval ASW capabilities.

The Cold War experience suggests that strategic stability with a nuclear triad is possible but conditional upon addressing four main potential problem areas: the need for bureaucratic and cultural change, the advances in ASW that accompany and drive advances in submarine technology, the geographic and geostrategic realities of expected operational areas, and the reconciliation of naval and nuclear strategies and doctrines. These conditions are both internal and external to the state introducing the system. First, the state must ensure that their delivery system is safe and reliable if their deterrent is to

131 Bernard Brodie and Fawn McKay Brodie, *From Crossbow to H-Bomb*, Revised and enlarged edition (Bloomington, IN: Indiana University Press, 1973), 293.

be credible; an undeliverable SLBM hardly offers an assured second strike. The bureaucracy must make the necessary changes to operational and tactical practices and procedures to ensure the safe operation of the system. For the United States, reliability was born of thoroughgoing changes within the submarine force, while for the Soviet Union, reliability was a by-product of a large fleet of SSBNs. Second, the state must address the problem posed by an adversary's ASW. Advances in ASW and advances in submarine technology are closely linked, and tend to drive arms racing behavior in this realm. Additionally, if an adversary does not accept mutual vulnerability and believes it can destroy the submarine-based second strike, a first-strike incentive remains. In the US-Soviet dyad, quantity had its own quality; in South Asia, the small fleet of *Arihant*-class SSBNs will be kept secure by the lack of robust Chinese or Pakistani ASW capabilities. Third, geography matters; distance and natural barriers combined with submarine detection abilities minimize concerns about bolt-from-the-blue attacks, while congested waters provide more acoustic cover as well as increase the risk of accidental collisions. Fourth, a state's nuclear strategy must clearly reserve its nuclear-armed submarines for retaliation against a nuclear strike, lest Schelling's argument about the possibility of a submarine-launched first strike become reality. Furthermore, naval doctrine must make clear that there is no intent to degrade the adversary's strategic forces.

The empirical foundations of the assumption that submarine-based deterrents stabilize adversarial nuclear dyads seem shaky at best. Furthermore, the logic and evidence of the Cold War may not extend to other cases, such as South Asia. The operational environment and force size and structure under consideration suggest that India's new SSBN will offer at most a marginal addition to its deterrent position, while generating pressure for further arms racing activity with Pakistan and a potential site for crisis instability with China. In the Sino-Indian dyad, India's fleet size and force structure are insufficient to generate the stability it hopes for, while in the Indo-Pakistan dyad, the nature of the conflict and the intense mutual distrust obviate any improvements in strategic stability that might otherwise be gained from the development of a secure second strike. Furthermore, India will require sustained financial and bureaucratic efforts to develop a capable subsurface force and more robust ASW capabilities, which may

prove a greater challenge than the Indian defense ministry is able to manage. Without these additional capacity-building efforts, *Arihant* will be little more than the technology demonstrator it was initially intended to be.

Troublingly, the mechanisms that made the nuclear triad stabilizing for the U.S. and the Soviet Union seem less available or palatable to the South Asian dyads, suggesting that sea-based deterrence may do more harm than good. While the U.S. and Soviet Union had an ongoing dialogue about restraining their nuclear forces, confidence-building measures and notification mechanisms are fairly thin on the ground in South Asia. As Raja Menon notes, “the Indian National Command Authority is ill designed to manage the inevitable South Asian transition from conventional war to a possible nuclear exchange — or the frantic strategic signalling [sic] that is bound to occur as the threshold approaches.”¹³² The operational aspects of the Cold War also do not pertain in South Asia. Setting aside the question of NATO’s Article 5 obligations, for the United States, the vast distances between the homeland and the Soviet Union provided some measure of security against the threat of a surprise first strike. With regards to Soviet SLBMs, distance gave U.S. sonar sufficient time and opportunity to detect Soviet subs approaching the GIUK gap. Until the Delta-class subs were introduced, the Soviet Union did not have an SLBM capable of reaching the U.S. without first transiting into the Atlantic. While the distance aspect holds true for the Sino-India dyad, for India and Pakistan, the question of distance is clearly moot.

Technological advances mean little if the state cannot figure out how to use it for strategic advantage, and there is little to indicate that a sea-based delivery system offers India a strategic advantage that is worth the risks and tradeoffs incurred. While it is taken as an article of faith in India that the acquisition of a sea-based deterrent is a logical step, there has been little public discussion about the underlying rationale for such a decision, nor has there been much analysis of the risks involved. It seems unlikely that China would be deterred by an Indian SSBN if it hasn’t been deterred by any other Indian nuclear capability; while China may find *Arihant* a sufficiently credible threat that it

132 Menon, “A Mismatch of Nuclear Doctrines.”

would refrain from a first strike, it's also plausible that if China were intent on executing such a strike, particularly before the K-4 missile is operational, it could adopt the tactics associated with the U.S.'s strategy for the GIUK gap. Under such an approach, China would plan to conduct intensive ASW patrols near the SLOCs surrounding the South China Sea to intercept India's SSBN before it could get within striking range of major Chinese population centers—assuming an Indian SSBN was even out on patrol at the time of the attack. For Pakistan, however, *Arihant* presents a clear threat that must be met with improved ASW capabilities, as well as another instance where Pakistan will be willing to eat grass to have what India has—in this case, a sea-based deterrent. As Vipin Narang argues, “the widely held belief that India's nuclear posture is one of ‘credible minimum deterrence’ is increasingly a myth. Presently, it is neither credible toward China, nor minimal toward Pakistan. As it continues to strive for the former... it is undermining the latter—in ways that could have significant consequences for a regional arms race.”¹³³ In building *Arihant*, India's technological abilities may have outpaced its strategic or doctrinal development, potentially generating the instability India had hoped to escape.

¹³³ Narang, “Five Myths about India's Nuclear Posture,” 147.

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